Inequality and Immigration

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Abstract: This paper investigates the relationship between immigration and inequality in the UK over the past forty years. This is a period when the share of foreign-born in the UK population increased from 5.3% in 1975 to 13.4% in 2015. We evaluate the impact immigration had on wage inequality in the UK through two channels: the first is the effect on the earnings distribution of the natives and the second is the effect on the composition of the wage-earning population. We find both effects to be very small. We decompose wage inequality into inequality within the immigrant and native group and inequality between the two groups. We find inequality among immigrants to be consistently higher than inequality among natives. We also examine the impact of immigration on the fiscal budget, and the potentially unequal impact of the ensuing tax implications on natives. In the UK, where immigrants are net fiscal contributors, this is not a factor that aggravates economic inequality. Even though the impact of immigration is found to be small, the way it is perceived across different population groups in the UK varies; a fact mostly attributed to racial and cultural concerns rather than perceived economic competition.

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1. Introduction

This paper is concerned with the interplay between immigration and inequality. Inequality has many dimensions and may relate to earnings, income, consumption and wealth. Migration can affect inequality between countries, in origin countries and in destination countries. In this paper we focus on the relationship between inequality and immigration in destination countries and specifically the UK. It is the impact immigration may have on wages, on the composition of the workforces, and on the location of the overall distributions of earnings both in the short run and over time where inequality and migration naturally intersect.

A good starting point to understand the basic relationship between migration and inequality are simple models such as those reviewed by Dustmann and Preston (2019). First of all, migration affects inequality *between* countries. In a competitive model, if individuals move across countries to where their marginal product is highest, this will lead to more efficient allocations of labour (creating a global welfare gain) and equalize average wages across countries. Migrants themselves are the main beneficiaries, moving to where they can earn higher wages, and to the extent that those who can gain most strongly from this are in poorer parts of the world this is inequality-reducing. Secondarily, there are effects also on the wages of those who do not move. The mechanism here is through labour supply changes, which lead wages in destination regions to fall, and wages in regions where migrants come from to increase.

If we consider that labour is differentiated by skills within countries then migration may furthermore lead to a reduction or an increase in inequality *within* countries, following the same mechanism. Unskilled immigration will lead to increased labour competition for unskilled workers in the immigration country, leading to possibly falling wages at the low end of the income distribution, but an increase in wages further up. The opposite happens in the emigration country. Thus, in this example, migration will lead to increasing the wage gap

between the lowest and highest earners in the immigration country but decreasing it in the emigration country. Skilled migration will have opposite effects.

Returns to other factors of production, such as capital and land, may also change as the arrival of additional workers makes these more productive and this also will affect inequality, depending upon where in the income distribution the owners of these other factors are found. To the extent that capital and landowners tend to be at the high end of the income distribution this will tend to increase inequality.

There may be many additional mechanisms by which the gains from migration could be re-distributed. Part of the additional earnings that those who migrate obtain may be reallocated to the source country in terms of remittances. This may lead to an increase in earnings of the families of those who migrated if such remittances are invested productively. This in turn may affect inequality in local communities if the families of those who emigrated (who are usually not the poorest) improve their economic situation in relation to others.

The focus of this paper is the UK, which is largely a destination country for migrations. There are various ways in which immigration can affect inequality in the UK. First, through the simple mechanism suggested above, where immigrants may decrease wages of those workers they compete with and increase those of workers to whom they are complements. Dustmann, Frattini and Preston (2013) (DFP) find indeed some evidence for this happening, but the effects are small. Such supply effects may be dynamic and long lasting when immigrants initially downgrade (i.e., work in occupations with skill requirements below those immigrants bring with them, due to, e.g., lack of complementary skills such as language proficiency), but then upgrade through additional skill acquisition to utilize their full earnings potential. Such upgrading may lead these competition effects to ripple through the earnings distribution of natives, something we investigate in ongoing work (Dustmann, Kastis and Preston 2022). Moreover, if immigrant composition differs from that of natives, migration could affect

inequality by simply changing the composition of the earnings distribution. There are not just dynamic, but also dynastic aspects of how immigration may affect inequality in the longer run. For instance, if immigrants are less mobile across generations, then this may contribute to a rise in inequality across generations.

If different groups, such as males and females or ethnic groups, differ in their skills and therefore the degree to which they are competing with immigrants, then immigration could also impact on inequality across groups, such as inequality across males and females or different ethnic groups. For instance, if immigration is low skilled, and a particular group (for instance earlier immigrants) is likewise predominantly low skilled, then a simple demand-supply framework predicts that the wages of this group is likely more affected, in comparison to other, better educated groups.

In this paper, we first illustrate the history of immigration to the UK over the past forty years, which was characterized by a sharp increase in the share of foreign-born individuals among the UK population. While immigration to the UK was initially driven by individuals from non-EU countries, the share of those born in the A8 countries sharply increased from 2004 onwards.[2] One outstanding feature of immigration to the UK is that immigrants were consistently better educated than natives. Despite that, they tend to be – at least initially - located in low-paying jobs.

We next investigate the impact of immigration on inequality. There are two ways immigration can affect the spread of the earnings distribution in the UK. First, by affecting native wages directly and differently along the distribution of wages. Secondly, by changing the composition of the overall work force. Extending work by DFP, we show that immigration slightly stretches the native earnings distribution by putting downward pressure on native wages at the bottom

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[2] A8 countries are those countries that joined the EU in May 2004, and comprise Poland, Slovakia, Slovenia, Lithuania, Latvia, Hungary, Estonia and the Czech Republic. They are grouped separately from the other two countries that joined the EU in 2004 (Cyprus and Malta), mainly due to their relatively similar geographical location in mainland Europe.

and benefiting native wages at the top. Moreover, we decompose overall wage inequality in the UK into wage inequality within the immigrant and native group and inequality between the two groups. Investigating wage distributions for the two groups in isolation, we find that wage inequality among immigrants has been consistently higher than among natives. Consequently, inequality in the population as a whole including immigrants is slightly higher than in the population of natives alone. However, this, as with any other effect of immigration on inequality, is very small.

The rest of this paper is organized as follows. In Section 2 we show how the presence of immigrants in the UK changed during these last forty years. In Section 3 we discuss the economic performance of these immigrants and in Section 4 we present estimates of the effects of immigration along the native wage distribution in the UK. In Section 5 we discuss how immigration can affect wage inequality in the host country and we decompose overall wage inequality into wage inequality within the immigrant group and within the native group. We also document the way wage inequality evolved within these two groups throughout the period of our study. In Section 6 we discuss how immigration can affect inequality through its fiscal impact explore how different population groups form attitudes about immigration, based on economic consideration and cultural concern. Section 7 summarizes findings and concludes.

2. Background

2.1 Immigration to the UK

We start this section by defining how we interpret the terms "migration" and "migrant". The Oxford English Dictionary's first definition of "migration" is as the "*movement of a person or people from one country, locality, place of residence, etc. to settle in another*". The "International Organisation for Migration" (IOM) defines a migrant as "*An umbrella term, not*

defined under international law, reflecting the common lay understanding of a person who moves away from his or her place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons." For our purposes, these are definitions that we will follow below. When presenting evidence in what follows about the UK, we define an individual as an "immigrant" if they were settled in the UK but born in another country than the UK, and as an "emigrant" if they were born in the UK but have emigrated to another country. Not all data sources report "country of birth", and we discuss other possible definitions, focussed less on place of birth, below.

[FIGURE 1A | FIGURE 1B]

Following this definition, we show in Figure 1A how the share of immigrants in the UK population has evolved over the past 45 years, based on data from the British Labour Force Survey (LFS).[3] We distinguish between foreign-born of all ages as a share of the overall UK population (dotted line), and foreign-born in the age range between 18 and 60 as a share of the UK population in the same age range (solid line).[4] The graphs illustrate a substantial increase in the share of immigrants within the UK population, in particular over the past 20 years. While the share of immigrants of all ages over the UK population rises only by 1.6 percentage points between 1975 and 1995 (from 5.3% to 6.7%), it increases to 13.4% by 2015. The share of immigrants within the age range 18-60 followed the same trend but was consistently higher throughout this period, reflecting a higher concentration of immigrants in the working age population.

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[3] The LFS is a sample survey of households living at private addresses. It includes only individuals who have been residents in the sample address for more than six consecutive months. As a result, foreign-born individuals who have been in the UK for less than six months are underrepresented in the survey.

[4] The LFS considers every individual from a sample household aged 16 and over. Foreign-born individuals who arrived in the UK as children and were aged 16 or over at the time of the interview are also included. We consider the age range 18-60 to measure immigrant concentration in the working age population.

Figure 1B distinguishes the percentage shares of immigrants in the UK population by age groups. The increase in the share of immigrants was most remarkable since 2000 in the age groups of 26-35- and 36–45-year-olds, which rose from 8% in 1975 to about 23% and 25% in 2019 respectively.

The UK experienced not just a large increase in the share of immigrants, but also a pronounced change in their origin. This is illustrated in Figure 2 which displays the shares of immigrants in the age group 18-60, distinguishing between countries that joined the EU before 2004, former Eastern and Central European countries that joined the EU in 2004 or later, Commonwealth countries, and the rest of the world.[5] The figure clearly shows that those born in countries of the Commonwealth still constitute the largest share among immigrants in the UK, although their share has declined over the past 20 years. Immigrants born in countries that joined the EU before 2004 accounted for about 35% of the immigrant population in 1975, but their share decreased to 15% in 2015. On the other hand, as a result of EU enlargement, the share of immigrants coming from countries that joined the EU in 2004 or later dramatically increased from less than 5% in 2005 to more than 20% in 2015. Finally, the share of those born in countries included in 'the rest of the world' group also substantially increased over the past 40 years.

[FIGURE 2]

It should be noted that the definition of a migrant adopted here is not the only way immigrants can be defined. As noted earlier, official statistics in many countries do not record country of birth but citizenship, which is then used to define immigrant populations. Even some UK statistics use that definition. For instance, in their statistics about the flows of immigrants into

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[5] There are 53 Commonwealth countries. The most populated are India, Pakistan, Bangladesh, Ghana, Kenya, Uganda, Nigeria, Malaysia, South Africa, Cameroon, Mozambique, Rwanda, Canada and Australia. Cyprus and Malta are included in the Commonwealth and not in the countries that joined the EU in 2004 or later. Countries that joined the EU in 2004 or later include the A8 countries together with Bulgaria and Romania (A2 countries), which joined the EU in 2007.

the UK, the ONS Long-Term International Migration (LTIM) estimates, which we also present in Figures 4, 5, 6A and 6B below, use "citizenship" rather than "country of birth" as a definition of who is an immigrant.[6] We compare the two definitions, using the LFS dataset, in Figure 3 for EU and non-EU born individuals (left panel) and EU and non-EU nationals (right panel), for the period between 1994 and 2016. The figure illustrates that the two definitions lead to starkly different assessments about immigration, with the latter being much lower than the former for non-EU immigrants, but not for EU immigrants. The difference is due to naturalisation of many of those who are born outside the UK, in particular from non-EU countries. In the same figure we observe that although the stock of non-EU born kept rising after 2009, the stock of non-EU nationals remained rather constant. In line with these graphs, data from the Home Office Immigration Statistics, which can be found in Appendix Table A4, report that nearly 950,000 UK citizenships were granted between 2009 and 2016 to individuals who were previously non-EU nationals, which largely explains the difference between the left and right panels in the figure.[7] As a result, the difference between those two definitions is driven mainly by non-EU immigrants who have a high naturalisation rate.

[FIGURE 3]

Net migration flows of non-EU nationals to the UK have been consistently higher than the net flows of EU nationals.[8] This is shown in Figure 4 for the period 2004-2019. This figure also shows that net immigration from the EU decreased sharply after the Brexit referendum in 2016,

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[6] Another difference between the definitions of a migrant in the LTIM and the LFS is that the LTIM consider only foreign nationals that enter the UK and intend to stay for at least a year, while the LFS includes foreign-born individuals that have been in the UK for more than six months.

[7] The Home Office Immigration Statistics do not provide information on citizenships granted by country of birth. We assume here that the number of individuals of previous nationality outside the EU is a good approximation for the number of individuals born outside the EU without being UK nationals.

[8] Note that nationality rather than country of birth is recorded in the LTIM (Long-Term International Migration) estimates, on which these numbers are based. The LTIM is a survey conducted at entry, so that foreign nationality and foreign born should not deviate much.

from 184,000 in 2015 to 50,000 in 2019, while net inflows of non-EU nationals increased from 189,000 in 2015 to 323,000 in 2019.

[FIGURE 4]

2.2 Temporary and Permanent Migrations

An important aspect of a migration is its permanency. The distinction between permanent and temporary migrants is of key importance if one is to assess performance and incentives of immigrants to integrate into the economy and society of the host country, both economically as well as socially, as explained in Dustmann and Görlach (2016b) and Adda et al. (2022) and discussed in Section 4. The permanence of migration also has important consequences for the fiscal contribution immigrants make over their life cycle to the receiving country, see Dustmann, Frattini, Giannetto and Görlach (2022).

We define here a "permanent migration" as a migration that lasts until the respective individual's exit from the workforce due to old age ("retirement"). A "temporary migration" is accordingly a migration that ends before an individual leaves the labour force. Accordingly, we define a migrant as a "temporary migrant" if his/her duration in the host country is temporary according to the above definition. While the early literature on immigration considered migrations as predominantly permanent, it is increasingly understood that permanent migrations may be the exception rather than the rule. Dustmann and Görlach (2016a) illustrate outmigration rates of immigrants from their host countries, distinguishing between European countries and Anglo-America, Australia and New Zealand. Not only are these outmigration rates high, but they are also far higher for the first than the second set of countries, illustrating interesting variation across host countries for the degree to which immigrations are temporary. Outmigration may affect inequality by the same channels as

immigration that we discussed above, through effects on wages, and through compositional changes.

For the UK, we display in Figure 5 the share of individuals from an arrival cohort who are still in the UK up to 10 years after arrival. To construct these figures, we use a methodology explained in Dustmann and Weiss (2007). The data stems from the International Passenger Survey – Long Term International Migration (IPS-LTIM) estimates and we focus on individuals who arrived in the UK between 2005 and 2015.The figure shows that a substantial share of immigrants leave the UK within the first five years after arrival.[9] More specifically, nearly 25% of non-EU nationals had left the UK five years after their arrival, with this share barely changing over the next five years, while such outmigration after the first five years was, at 40%, substantially higher for EU-nationals. There are slight differences between EU14 countries and A8 countries, with 45% of EU-14 nationals having left the UK five years after their arrival, while over the same period 35% of those from A8 countries have left.

[FIGURE 5]

2.3 Causes of Migration

Migrations have many different causes. Economists commonly focus attention on the economic aspects of migration decisions, based on individuals' assessment of the economic benefits of remaining in the region or country of current residence or birth, and migrating to an alternative region where economic conditions are more favourable.

A simple intertemporal model for migration might pay attention to the economic gain from migration K, expressed as follows:

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[9] Dustmann and Weiss use the LFS data from the period 1992-2002. Here we use the IPS data for the period 2005-2016 and compute these survival rates for non-UK citizens. The IPS data are collected on entry of foreign nationals in the UK and provide information on the number of these nationals that leave the UK in each of the following years. Estimates of out-migration rates computed from the IPS data are similar to estimates based on the LFS.

$$\sum_{t=0}^{T} y_{It} \frac{1}{(1+r)^t} - \sum_{t=0}^{T} y_{Et} \frac{1}{(1+r)^t} - C = K, \qquad (1)$$

where y_{kt} are the income flows in the emigration ($k = E$) and immigration ($k = I$) country, r is the discount rate, and C are the costs of migration. These costs can include both monetary costs (such as migration costs, preparatory costs etc.) and also psychic costs (such as loss of contact with family, costs of cultural change, etc., expressed in monetary equivalents). The migration decision is taken in base period 0, and the productive life of an individual lasts T periods. If $K > 0$, a migration will take place.

This simple model emphasises that migrations are not based on current differences in economic opportunity between two regions, but on the discounted current values of incomes in the two alternative locations. The intertemporal nature of migration decisions explains why migrations may not take place even if current economic advantages are large, or why they do take place despite very small *current* wage advantages.

The model in (1) can (and has been) extended in many directions. Migration costs may contain a dynamic element, where future considerations (e.g., opportunity for children etc.) play an important role. One could further consider uncertainty about future earnings (Bellemare 2007), introduce a utility function that allows for non-monetary preferences in origin or destination region (Piyapromdee 2020), add differences in purchasing power in origin- and destination region (Kirdar 2013), etc. Complex models such as Adda et al. (2022) allow in addition for investment into different forms of human capital and non-permanent migrations.

While economic migrations are what economists commonly investigate and model, migrations may also have non-economic reasons. One important such reason is family re-unification. While, initially, migrants tend to be male, it is usually the case that the first wave of economic migration is followed by re-unification, which is when there is a tendency for wives and

children to move to join them in the host country. More particularly, 56% of non-EU family re-unified immigrants who entered the UK in 2018 were women who followed their husbands and 11% were children (Home Office Immigration Statistics).[10] These migrations are considerable in magnitude, even though the share of the migrant population in the UK they explain decreased since the 1990s. Among those who moved to the UK between 2016 and 2018, the share of those who declared that the reason for their migration was to accompany or join a family member was estimated to be 12% (ONS, Long-Term International Migration Estimates August 2020, Table 2).

[FIGURE 6A | FIGURE 6B]

In Figures 6A and 6B we use the ONS Long-Term International Migration (LTIM) estimates for the period 2010-2019 to plot the evolution of inflows to the UK of EU and non-EU nationals by reported reasons of migration. Inflows for work-related or family reunification reasons have been more common among EU nationals in comparison to inflows for study. In contrast, as we see in Figure 6B, inflows of non-EU nationals have been largely driven by those who wish to study. Inflows of EU nationals for work related or family reunification purposes between 2015, the year before the Brexit referendum, and 2019 decreased by 109,000 individuals i.e., by 56%. EU inflows for study reasons up until 2019 remained largely stable.

Another important form of migration is flight from adverse conditions in the country or region of origin due to persecution, war, or natural disaster (see Dustmann et al. 2017 and Fasani, Frattini and Minale (2021) for discussion and Brell et al. 2020 for analysis of refugees' economic assimilation). The status of refugees is grounded in Article 14 of the 1948 Universal Declaration of Human Rights, which recognizes the right of persons to seek asylum from persecution in other countries, and which has its origins dating back to the aftermath of World

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[10] Home Office Immigration Statistics, year ending June 2019, Admission Table ad_03_f. The information presented here is based on data on permits to enter the UK granted to family reunification migrants. Such permits are only available for non-EU nationals, as EU nationals have a right to move to the UK due to free mobility.

War II and the refugee crises of the preceding interwar years. The United Nations Geneva Convention relating to the Status of Refugees (GCR) was adopted in 1951.[11] Most countries are signatories of the Geneva Convention for Refugees, committing them to provide protection for individuals who leave their origin country due to personal persecution.

[FIGURE 7]

As illustrated in Figure 7, asylum-related grants of settlement in the UK were comparatively high in the early 2000s but dropped significantly afterwards.[12] According to the Home Office Immigration Statistics, the total number of asylum-related grants of settlement in the UK reached 10,747 in the first quarter of 2001, but only 1,088 in the third quarter of 2020. Note that, however prominent refugee migration might be in popular discussion, these numbers are consistently very low compared to other forms of migration. The higher number of granted asylum claims in the early years of the 2000s reflected the rise in asylum applications worldwide as well as the UK during the late 1990s and the early 2000s (Hatton, 2009). The Immigration and Asylum Acts of 1999 and 2002 established stricter border controls, speeded up the examination of asylum applications and increased the number of the criteria needed to positively decide asylum claims, which led to the sharp decrease in asylum-related grants in the UK after the early 2000s.

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[11] In its first article, the convention defines the refugee as follows:

[any person who] owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country; or who, not having a nationality and being outside the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it.

Being based on the concept of individual persecution, the GCR definition of refugees does not specifically address the more general issue of civilians fleeing wars and conflicts. The United Nations High Commissioner for Refugees (UNHCR), however, considers that persons fleeing civil wars and ethnic, tribal and religious violence and whose country of origin is unwilling or unable to protect them should be considered refugees even if they are fleeing a general rather than an individual threat.

[12] "Asylum-related grants of settlement" is the term used in official statistics to define the successful asylum applications.

2.4 Immigration to the UK in International Context

Figure 1A shows that the share of immigrants in the UK increased from 5.3% percent in 1975 to 13.4% percent in 2015. This increase is in line with a global rise in international migrants. The total number of international migrants increased from about 161 million people in 1995 (2.8% of the world population) to almost 272 million (or 3.5% of the world population) in 2019. In Europe, Northern America, Australia/New Zealand and Japan alone, the share of immigrants increased from 7.9% of the population (92 million) to 12% (or more than 150 million) in 2019 (UN, Dept of Econ and Soc Affairs, 2019).[13] Figure A1 in the appendix shows that the share of immigrants in the UK's population is quite modest in comparison to countries such as Australia and Switzerland. The figure also illustrates that the share of immigrants has increased substantially across all countries depicted, and for some countries considerably so. Obviously, all these figures illustrate that international migration has increased considerably in magnitude, and that such is the case among all developed countries. What are the reasons for why we have seen migration to increase so substantially?

Economic reasons are likely to play a major role. After WWII migration to the UK started as a result of an excess demand of lower skilled labour, fuelled by the expanding industrial production of Europe's manufacturing sectors. In case of the UK, immigrants in post-war years were first drawn from Europe and then increasingly from former colonies and subsequently commonwealth countries– the arrival of the Windrush in 1948 with former Caribbean service men is often seen as a symbol of these early labour migrations though immigration from India, Pakistan and later East Africa was also substantial. This movement slowed down considerably in the early 1970's, after the first Oil crisis, which brought an end to the rapid expansion of

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[13] The share of foreign-born population in the US rose from 4.7% in 1970 to 13.5% in 2015 (Migration Policy Institute). In Europe, the population share of migrants in Germany increased from 7.5% in 1990 to 14.9% in 2015, while the share of migrants in the Spanish population drastically increased from 2.1% to 12.7% during the same period. The share of migrant population also rose in France from 10.4% to 12.1% (World Bank Development Indicators).

Europe's manufacturing industries, and as increasingly restrictive immigration legislation was introduced.

As Figure 1A shows, the share of immigrants grew only slightly from the mid-1970s until the mid 1990s. The early 2000s saw a repeat of economically driven immigration. Over the period between 1997 up to the Great Recession the UK economy grew at a considerable pace (at around 3% in real terms) and experienced a lack of qualified tradesmen and service workers in sectors such as the health, the care sector and hospitality, among others. More specifically, employment in the public sector expanded by 19% between 1994 and 2010, while immigration accounted for 29% of this growth (Dustmann and Frattini, 2011). On average, foreign-born public employees made up 10% of the healthcare sector over the period 1994-1996, and this share rises to 14.1% in the years 2008-2010. When in 2004 eight Central and Eastern European countries joined the European Union, the UK waved (together with Ireland and Sweden) the seven years transition period over which old EU member states could deny access to citizens of new member states to their labour markets (Article 24, Part Four, Act of Accession 2003).[14]

This triggered a substantial immigration, as illustrated in Figure 2, predominantly from Poland and the remaining seven countries in the A8 group that joined the EU in 2004. Immigrants arriving from the A8 countries were young and predominantly well educated. While this addressed the scarcity of labour in many sectors, it was also seen by many as a concern and was associated with a rise in anti-immigration sentiment in particular towards EU immigration. As a result, when Bulgaria and Romania (A2 countries) joined the European Union in 2007, the UK imposed restrictions to limit migration of nationals from these countries only to students, self-employed, highly skilled and food and agricultural workers.

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[14] In the Accession Treaty of 2003, the old member states can impose a transition period for up to 7 years restricting workers from countries joining the EU to be employed on equal and non-discriminatory terms in their labour markets. Such transitional arrangement could be imposed for 2 years initially, and extensions needed to be decided for another 3 years. The period could then be extended for another 2 years.

While the increase in immigration was often blamed on the EU's statue of free movement of labour, it is interesting to observe in Figure 4 that net migration into the UK was consistently higher (and above the target of 100,000) from non-EU countries than from EU countries since the early 2000's, even though non-EU immigration is in principle controllable by the UK government. Some suggest that this indicated that the need for workers remained an important factor for immigration into the UK throughout the period.

Refugee migration is driven largely by political circumstances in origin countries and acceptance of refugees can be seen as the UK fulfilling its obligations under the Geneva convention. We commented in the previous section on the rise in the asylum-related grants of settlement in the UK towards the end of the 1990s and early 2000s. According to the convention, the UK is obliged to examine applications for asylum from displaced people who reach the country's soil. In particular from the early 2000s onwards, the UK has implemented stricter border controls, stronger penalties on migrant smugglers and faster and more efficient examination of asylum applications to reduce the inflow of undocumented migrants. Moreover, financial support of asylum-seekers waiting for a decision on their application has been reduced, which is seen by some as a tool to discourage refugee migration.

2.5 Immigrant Selection

Despite the first immigrants to the UK being predominantly targeted for lower skilled jobs, immigrants to the UK over the past 40 years have been consistently better educated than the native workforce. This can be seen from Figure 8, which illustrates the share of college educated immigrants versus native born (scale on the left vertical axis) and the difference between average years of full-time education (scale on right hand side axis) of immigrants versus natives, since 1981. In the earlier two decades this educational advantage was partly due to the low education level of the UK labour force – in, e.g., 1981, although only 10% of foreign-born individuals aged between 18 and 60 years old were college educated, the corresponding

share was less than 10% for UK born workers. Educational attainments of the native-born workforce increased substantially (in, e.g., 2019, more than 30% of the UK native born workforce held a college degree or tertiary qualifications), but so did the educational attainment of immigrants to the UK, with the share of those with college education being higher than 40% in 2019. The same educational gap in favour of immigrants is reflected in the right-hand-side graph of Figure 8. The average years that immigrants spend in full-time education were consistently higher than the average years that natives spend throughout the forty years of this study.

[FIGURE 8]

The UK stands out internationally for its very well-educated immigrant population. Figure A2 in the appendix compares educational attainments measured as the share of tertiary educated across different industrialised countries. Remarkably, the share of tertiary educated immigrants in the UK is (at 49.8% percent) almost the same as in Australia, which runs a highly selective and education-based immigration policy.

Economists have been long interested in what determines the selection of immigrants in terms of their skills. The simple economic model in (1) suggests that immigrants migrate to countries where the price they obtain for their skills is highest. Borjas (1987) was the first who formalised this idea based on the Roy model, which goes back to a paper by A.D. Roy in the Oxford Economic Papers in 1951. Roy develops in that paper the implications of multi-dimensional abilities for occupational choice, the structure of wages, and earnings distributions. The model has later been formalised in a number of papers, see, e.g., Willis and Rosen 1979, Heckman and Sedlacek 1985, and Willis 1986. We will briefly develop the key idea of the Roy Model and refer the reader to more detail in Dustmann and Glitz (2011). Let

$$y_{ij} = lnY_{ij} = \mu_j + b_{j1}S_{1i} + b_{j2}S_{2i} \qquad (2)$$

Equation (2) expresses the log of earnings Y_{ij}, y_{ij}, of individual i in country j as a linear function of μ_j, the rental rate of human capital, and the stock of human capital, which is the linear combination of price weighted skills S_1 and S_2, where skill prices b_{j1} and b_{j2} are country specific. The above equation allows for two-dimensionality of skills (say cognitive and creative skills), which of course can be easily extended to multiple dimensions. The skill-price weighted sum of skills, $b_{j1}S_{1i} + b_{j2}S_{2i}$, is often referred to as "human capital" (see Dustmann, Fadlon and Weiss 2011). With this definition, migration from a country with low skill prices to a country with higher skill prices can be considered as an investment in human capital.

Facing the choice between two countries (say the birth country, and a possible immigration country), the migrant will decide for the country where his earnings are highest, which will depend on the rent on human capital μ_j as well as on skill prices b_{kj}.

Let $\mu_I - \mu_E = \mu$. Then the decision to migrate will be based on comparison of earnings in immigration- and emigration country, and a migration will take place if $(b_{I1} - b_{E1})S_{1i} + (b_{I2} - b_{E2})S_{2i} + \mu > 0$.

Assume for the moment that $\mu = 0$. It may well be that prices for skill 1 are higher in the immigration country $(b_{I1} - b_{E1}) > 0$, but those for skill 2 are higher in the emigration country $(b_{I2} - b_{E2}) < 0$. In such case, those with high S_1 (relative to S_2) will be more likely to emigrate, while those with high S_2 (relative to S_1) will be more likely to remain in the home country. It is obvious that in such case, no ranking of immigrants is possible; whether someone is a migrant depends on the *relative prices* of skills in the two countries, which in turn depend on the industry structures and the relative scarcity of skills in the two economies.

Consider now the case where skills are one-dimensional, which is the type of Roy model most migration economists have used. This would, e.g., be the case if skill 1 had no value in either country, so that the migration choice would reduce to $(b_{I2} - b_{E2})S_{2i} + \mu > 0$. In this case, migration will take place if the first term is larger than the second term. Suppose now that $\mu <$

0, but $b_{I2} > b_{E2}$. In this case, individuals with low skills S_2 may find it disadvantageous to emigrate, due to the lower rent on human capital abroad, but those with high skills gain through migration. Thus, this implies that those who migrate possess more of skill 2 than those who remain in the home country, so that migration is positively selective. Of course, the opposite is the case when $\mu > 0$, but $b_{I2} < b_{E2}$. Thus, with one dimensional skill this model predicts that immigration will either be positively or negatively selective. Given the assumptions we have made about the distribution of skills S, a positive selective migration would imply that $Var(y_I) = b_{I2}^2 > Var(Y_E) = b_{E2}^2$, so that the variance of earnings is higher in the immigration country.

This insight is the basis for many empirical papers that seek to investigate the selectivity of migration, starting with Borjas' (1987) original work. Chicquiar and Hanson (2005), Ibarraran and Lubotsky (2007), Fernández-Huertas Moraga (2011) and Kaestner and Malamud (2014) have studied the selectivity of Mexican migration to the United States, while Ramos (1992) explored selection of Puerto-Rican immigrants moving to the United States. Abramitzky, Boustan and Eriksson (2012) reached findings that were partly consistent with the Roy/Borjas model when investigating migration from Norway to the United States during the Age of Mass Migration. It should be noted that unambiguous statements about selection of immigrants are only possible under very restrictive assumptions about skill structures, in particular the assumption that that there is only one dimension of skills.

We illustrate the pattern of selection in Figures 9A-9C below. Consider first Figure 9A. The top panel illustrates the distribution of earnings in the destination (upper graph) and the origin (lower graph), while the bottom panel graphs the relation between skills and wages in the source- and destination country. Figure 9A relates to the case where there is one dimension of skills only (say S_1), and where the rental rate on human capital μ is the same in both countries. The way the figure is drawn, the price for skills is higher in the destination country, so that

$b_{I1} > b_{E1}$, which implies that $Var(y_I) > Var(y_E)$. It follows (assuming zero migration costs) that it is worthwhile migrating for all individuals in the origin country whose skills are larger than the mean of S_1 which we have normalised to be zero. The graph in the bottom panel illustrates this – the wage gap between destination and origin becomes larger the larger the level of skills. With this scenario, those who emigrate have higher than average earnings in both countries, while those who don't emigrate have lower (potential) earnings in both countries, but higher earnings in the home- than in the host country. Thus, this scenario leads to positively selective migration. Following Borjas (1987), a number of subsequent papers investigate the selectivity of migration, testing the hypothesis that migration is positively selective if the variance of earnings is higher in the destination country – or more generally, if the variance in the destination is large relative to the covariance, and the variance in the source country is small, relative to covariance.

So far, we assumed that $\mu_I = \mu_E$. If the rental rate on human capital is higher in the destination $\mu_I > \mu_E$ (which could be due to, e.g., superior production technologies), the upper graph in the top panel of Figure 9A will shift to the right, and migration will be worthwhile for a larger part of the population in the source country, which will reduce the degree of selection. Even if $b_{I1} = b_{E1}$ (the price for skills is the same in the two countries), a higher rental rate on human capital will lead to migration if $\mu_I > \mu_E$. In the extreme where $b_{I1} = b_{E1}$, migration will be equally worthwhile for individuals along the entire distribution of skills, and there will be no selection. This situation corresponds to the two lines in the graph of the bottom panel running parallel, with the one for the destination country being above the one for the origin country.

Figure 9B illustrates the opposite situation, where the price for skills is higher in the origin country, which leads to negatively selective migration.

An interesting third case occurs if skill prices are such that the same combination of skills would place an individual high up in the earnings hierarchy in one country, but low down in

the other. Willis (1986) refers to this as "*Non-hierarchical Sorting*": unlike the two cases above, it is no longer possible to sort individuals according to their skills in a way that is consistent across countries. Borjas (1987) has referred to this case as "refugee sorting", a reference that was probably motivated by refugee migrations at the time being characterised by the highly educated fleeing dictatorial regimes that saw educated citizens as a threat. More generally, this case is interesting when considering economies that specialise on particular sectors (which require particularly talented and educated workers) in a global economy where trade allows such specialisation (see Dustmann and Glitz 2011 for a discussion).

One can think of this arising most naturally with multiple skills where skill 1 is only valuable in the origin country, while skill 2 has only value in the destination country. In that case, and making again the assumption that $\mu_I = \mu_E$, the earnings of those who decide to migrate are higher than the average earnings in the host country, but they are lower than the average earnings in the home country. Moreover, the earnings of those who do not migrate would be lower than mean earnings in the host country, had they migrated, but higher than average earnings in the home country. Those who migrate have a below-average productive capacity in their origin country, but an above-average productive capacity in the receiving country. Alternatively, one could imagine a case with a single dimension of skills which is positively rewarded in one country but negatively rewarded in the other as illustrated in Figure 9C.

The different scenarios have implications for earnings inequality in the destination as well as the source country. For instance, the first scenario, where skill prices are higher in the destination, would remove mass from the earnings distribution in the sending country and add mass to the upper tail of the earnings distribution in the receiving country. Within country wage inequality would thus be reduced in the sending country, but increased in the destination; moreover, between country wage inequality would be enhanced, as mean wages will increase in the destination, but decrease in the origin.

Interesting is the case where we consider two skills, with one being more valuable in the destination, while the other is more valuable in the source country. In that case, migration will lead to a better allocation of skills in both countries, thus increasing mean earnings in both source and destination. Moreover, inequality in the sending country will be reduced as those at the low end of the skill distribution will be removed, and possibly increase in the destination as we add mass to the top of the distribution.

Our considerations above excluded migrations from what we called the destination to the source country; however, such movements are certainly possible as well, with the overall implications being quite obvious from the above considerations. Moreover, we have assumed that skill prices are constant. That is unlikely to be the case – skill prices will be determined by supply and demand and the production technologies, so that, e.g., removing high skilled workers in scenario 1 above from the source country will increase the price for skills in that country, while it will decrease the price for skills in the destination, with implied consequences for inequality.

[FIGURE 9A | FIGURE 9B | FIGURE 9C]

3. The Economic Performance of Immigrants

3.1 Downgrading

We have shown above that immigrants in the UK are remarkably well educated, which would place them very much up the distribution of earnings. However, skills as usually measured in terms of full-time education or labour market experience that are acquired in the origin country are not perfectly transferable, at least initially. Moreover, immigrants upon arrival may not possess complementary skills that allow them to make their existing skills productive in the

host country's labour market. One such skill is language proficiency – a skilled surgeon is unlikely to be allowed to practise if she does not speak the English language.

All these lead immigrants to "downgrade" relative to where we would assign them in the distribution of earnings based on their measured skills. Such downgrading is likely to be more severe in countries where immigrants are well educated, such as the UK. Thus, despite their considerably higher educational attainment UK immigrants tend to substantially "downgrade" upon arrival, working in jobs that are in far lower earnings categories than where they would be allocated based on their education alone.

[FIGURE 10]

We illustrate that in Figure 10 where we follow Dustmann, Frattini and Preston (2013) to display the density of newly arrived immigrants in the UK (arrival within the past two years). The dashed line allocates them in the native earnings distribution according to where they would be situated if the return to their observable skills (education and age) equalled that of natives.[15] Not surprisingly, and in accordance with the high level of education that we illustrate above, immigrants can be found predominantly in the higher percentiles of the native earnings distribution. This however contrasts dramatically with where they are situated, as indicated by the dotted line, which shows that the density of newly arrived immigrants is far higher than that of natives at the lower parts of the distribution. This downgrading is a common feature of migrations (see evidence for Germany and the US in Dustmann et al (2016)), although more extreme in countries where immigrant populations are highly skilled.

It is likely that initial downgrading is followed by subsequent upgrading as immigrants acquire complementary skills and transfer their existing skill sets to the particularities of the receiving country. This is precisely what is illustrated in Figure 11, where we show the position of

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[15] We measure earnings as hourly wages deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.

immigrants in the native earnings distribution, distinguishing groups with varying durations in the UK. The figure shows that indeed immigrants upgrade, with the densities of those with 14-16 years of duration being now more similar to where allocation according to observable skills would put them in the distribution.

[FIGURE 11]

It is clear from the figures that the degree of initial downgrading, as well as upgrading in subsequent years, impacts on the distribution of earnings of immigrants, and – through dynamic effects on skill prices and composition – on earnings inequality of natives. We address this issue below and investigate the dynamic implications in another paper (see Dustmann, Kastis and Preston 2022).

Moreover, Figure 11 is based on cross sectional data. One reason for what we interpret as "upgrading" may be compositional changes as immigrants out-migrate, something illustrated in Figure 5. It should be noted that – if considering inequality in earnings and how it is related to immigration – this is part of the dynamics that determine the distribution of earnings in the UK. However, it is of interest to understand to what extent compositional changes through selective outmigration may indeed be responsible for the dynamics illustrated in Figure 11. In Appendix Figure A3 we display the predicted position of immigrants in the native wage distribution, assuming that returns to education are equal to that of the natives and distinguishing between the same arrival cohorts as in Figure 11. The predicted densities are closely aligned, suggesting that selection based on education is not the driving force behind the upgrading profiles in Figure 11.

3.2 Economic integration

Upgrading requires immigrants to accumulate new skills and to transform existing skills so that they are productive in the receiving country. To what extent such investment takes place

depends on immigrants' incentives whether, and how much, to invest into human capital in the destination country. Incentives to invest into new skills that are specific to the destination country's labour market depends – among other things – on the perceived future duration of the immigrant in the destination country. This is where the distinction between permanent and temporary migrations becomes important. If large parts of skills are host country specific (e.g. if the language of the host country has little value in other countries), then the pay off period of any investment becomes an important factor that impacts on the investment decision. For instance, two identical immigrants aged 20, one with the intention to remain for 5 years in the host country, the other with the intention to remain permanently, will have very different incentives for investment into skills that are of low value outside the immigration country. Thus, transferability of skills, and the degree to which migrations are temporary, will play an important role to explain career paths of immigrants in the receiving country.

The performance of immigrants in the host country has been of intense interest to economists, and a large literature is concerned with the estimation of immigrants' earnings profiles (see Dustmann and Görlach 2015 for a survey). The first paper to investigate this is Barry Chiswick (1978) who uses the 1970 US census to assess immigrants' earnings paths in comparison of those to natives. Chiswick's main findings are that immigrants upon arrival to the US have an earnings disadvantage of about 17 percent; however, after about 10-15 years in the US labour market, their earnings overtake those of native workers. Chiswick explains this by suggesting that immigrants have "more innate ability, are more highly motivated towards labour market success, or self-finance larger investments in post-school training". In a subsequent paper Borjas (1985) shows that estimation based on cross sectional data may lead to misleading conclusions, because immigrants who differ in their years of residence in the host country have also arrived at different points in time. Thus, if immigrant entry wages change over time, then Chiswick's cross-sectional study may confound differences in immigrant cohort quality with

assimilation. Borjas provides convincing evidence that that is indeed the case for the US. Dustmann et al. (2021) show that the decline in entry wages of immigrant cohorts in the US over the period Borjas considers may not only be due to a decline in skills, but also due to exchange rates of immigrants coming from countries where the US dollar has high purchasing power, therefore leading immigrants to have low reservation wages upon entry, resulting in lower wages.

Adda et al. (2022) point out that not only may changes in entry wages across cohorts lead to misleading conclusions about immigrants' career paths, but selective outmigration may likewise lead to mis-assessment of the steepness of their career profiles: If outmigration is selective, in the sense that the most (least) skilled immigrants leave the country first, then this will lead to a downward (upward) bias in estimated earnings profiles for the original arrival cohort. Longitudinal data allow this issue to be addressed but require – in the most general case – the researcher to model the process of outmigration alongside the career profiles of immigrants, similar to a simple attrition model (see Dustmann and Görlach 2015). When imposing the additional assumption that the selection of leavers depends on time constant and unobserved characteristics, data that follow surviving immigrants backwards are sufficient to address this issue (see Lubotsky, 2007).

It is however unclear whether the researcher should be interested in the counterfactual earnings profile of immigrants if outmigration had not happened. If for instance the focus of interest is on the contribution immigrants make to the host country in terms of taxes, or how they impact on earnings inequality, all that matters are the earnings of those immigrants who remain, and who are observed in the UK at a given point in time. Selection itself becomes part of the parameter of interest (see also discussion in Dustmann and Görlach 2015).

But not only selective outmigration matters for the estimation of immigrants' earnings profiles. The fact that immigrants may consider leaving the country before the end of their productive

life severely shortens the pay off period for any investment in human capital that is not fully transferable to the home country. Thus, immigrants' investment into human capital is jointly determined with the optimal duration in the country of destination. Dustmann and Görlach (2016a) discuss different reasons as to why a migration may be temporary, and how such temporariness affects earnings and savings profiles of immigrants. Adda et al. (2022) take this further, by modelling the career paths of immigrants where shocks affect intended migration durations and investments into human capital.

Overall, the estimation of immigrants' earnings profiles is challenging, due to factors influencing the chosen career paths of immigrants that vary between individuals and are usually not observable for the researcher. On the other hand, for the purpose of determining how immigration affects the dynamics of inequality, all that the researcher needs to know are the observed earnings of immigrants in the host country, where interest focusses on those of a given arrival cohort that survived until the observation year. These numbers are readily observable in survey data, as such as the repeated cross sections we use for the analysis below.

4. Effects on labour market outcomes of natives

A key question is how immigration affects the welfare of residents in the receiving country. Not surprisingly therefore a large literature has developed that investigates this very issue. Most of these papers think about immigration as a "labour supply shock" which shifts the labour supply curve down the demand curve. In consequence, immigration should lead to a decrease in wages (and possibly to a loss in employment) of those native groups that are in direct competition with immigrants, i.e., who have similar skills. On the other hand, immigration may lead to increase the productivity of factors of production that are complementary to immigrants, such as capital, or labour in other skill groups. Overall, immigration – if viewed through the lens of such a simple model and if we assume capital is internationally mobile – will only lead

to wage effects if immigrants differ in their skill composition from natives; it may lead to a decline in wages of those who are similarly skilled, and possibly an increase in wages of those whom they complement. Moreover, immigration will lead to an overall surplus that accrues to those factors that are complementary to immigrants. Effects on the sending country are simply a mirror image. Dustmann and Preston (2019) develop the effects immigration has on earnings and welfare in sending and receiving countries, under various assumptions, and summarise the literature.

Alteration of factor prices is not the only way a receiving economy can adjust to a labour supply shock induced by immigration. Several alternative adjustment mechanisms have been suggested by which economies can absorb a labour supply shock without needing wages to change. First, immigration induced labour supply shocks, by changing the relative price of factors of production, can be absorbed by changing the mix an economy produces. Such adjustment would be predicted for a small open economy with more traded goods than factors of production by a simple trade model such as the Heckscher-Ohlin model. In this model, where firms operate production under constant returns to scale, prices of traded output goods are set in international markets, and so are (by duality) factors of production, including wages. Immigration will simply shift production towards industries that use labour represented by immigrants more intensively, thus expanding production, and absorbing the additional labour supply, with wages remaining the same. Trade will allow natives to consume the same output mix as before. This model predicts that wages remain the same; however, in such setting, immigration will not produce a surplus. This mechanism has been suggested in e.g., Hanson and Slaughter (2002), and is discussed in Card and Lewis (2007).

Similarly, an immigration induced labour supply shock can also be absorbed by a change in technologies. The idea is similar to the one explained above: Immigration will lead firms to adopt new technologies and adjust production such that additional labour supplies are absorbed

through changes in factor shares. Again, with such adjustment, wages remain the same, and the additional labour supply will be absorbed. As with trade adjustment, there will be no migration surplus. Lewis (2011) provides evidence of technology adjustment to immigration shocks, and Dustmann and Glitz (2015) show that technology adjustment to immigration induced labour supply shocks are likely more important than adjustments through the mix of output.

Empirical research concerned with estimating the causal effect of immigration on wages, output mix or technology of residents faces the classical identification challenge. Researchers observe wages of natives before and after immigration. What is not observed are counterfactual wages of residents after immigration if immigration had not taken place. The challenge for empirical work is to re-produce this missing counterfactual. The construction of this missing counterfactual is at the core of applied academic research on the impact of immigration.

A very common way to construct a counterfactual in the literature is to utilise differential immigrant inflows into different regions of a country, and to regress the change in regional wages on the immigration inflow. While this approach eliminates persistent regional differences in economic conditions, it is still bedevilled by shocks to regional economic conditions being potentially correlated with immigrant inflows: immigrants will typically settle in areas where economic conditions are favourable. To address this, many papers use variation in existing immigrant settlement across regions to instrument immigrant inflows, assuming that past settlement of immigrants is uncorrelated with future economic shocks (see, e.g., Altonji and Card (1991) for an early application of this approach).

Dustmann, Frattini and Preston (2013) use this identification strategy to investigate the effect immigration has along the entire distribution of native wages. In their approach, they regress native wages at points along the native wage distribution on the total immigrant inflow. Their methodology does not rely on assigning immigrants to skill cells, recognising that such pre-

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allocation would potentially lead to allocation different from where immigrants can be found to compete with natives, as is illustrated in Figure 10 above.

Using data from the UK LFS, we employ the same strategy for Great Britain[16], updating analysis of DFP for the period 1994-2016. We regress the changes in regional wages at percentile p of the native wage distribution ΔlnW_{prt} on the change in the regional immigrants-to-natives ratio Δm_{rt}, year fixed effects α_{pt} and changes in controls $\beta_p \Delta X_{rt}$ which include the average age of immigrants and natives and the log-ratio of high- to low-educated and intermediate- to low-educated natives.

$$\Delta lnW_{prt} = \alpha_{pt} + \beta_p \Delta X_{rt} + \gamma_p \Delta m_{rt} + \Delta \varepsilon_{prt} \tag{3}$$

In the bottom panel of Figure 12 we present IV results from estimating equation (3) along the distribution of native wages, where we instrument[17] the change in the immigrants-to-natives ratio Δm_{rt} by the four-year-lag of the ratio in levels.[18] In the top panel of the same figure, we plot the relative density of newly arrived immigrants along the native wage distribution. The figure is remarkably similar to that in DFP (2013), for the period 1997-2005. It suggests that immigration has put a slight downward pressure on native wages at the bottom of the native wage distribution, precisely where recently arrived immigrants are more concentrated than natives. Native wages at higher percentiles of the distribution, where the concentration of immigrants is lower relative to natives, slightly increase.

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[16] Northern Ireland is excluded from this estimation due to insufficient data in the 1994 LFS.

[17] The choice of the instrument is motivated by studies (see Bartel 1989; Munshi 2003) showing that settlement patterns of previously arrived immigrants are good predictors of immigrant location choices. F-stats for the instrument are presented in Appendix Table A1 and indicate strong correlation between the instrument and the change in the immigrants-to-natives ratio.

The instrument is valid only if economic shocks, described by $\Delta \varepsilon_{prt}$, are not too persistent. We preformed Arellano-Bond tests and the absence of third-order autocorrelation among the errors could not be rejected. As our instrument is based on immigrant settlement patterns from four years ago, then it cannot be correlated with current economic shocks. As a result, the instrument affects current wages only through current immigrant location choices and its exclusion from the main equation is justified.

[18] For detailed results, see Table A1 in the Appendix.

[FIGURE 12]

More specifically, we find that an immigrant inflow of 1% of the native labour force decreases wages at the 5th and the 10th percentile of the native distribution by 0.20% and 0.24% respectively, with estimates being statistically significant. On the other hand, a 1% inflow induces an increase of 0.05% and 0.16% of native wages at the 75th and the 90th percentile respectively, with only the effect on the 90th percentile being statistically significant. The average increase in the immigrant-to-native ratio over the period considered was about 0.52% per year, while the real hourly wage increased by 8 pence per year at the 5th and the 10th percentile (by 1.76% and 1.56% respectively), and by 27 pence (1.34%) per year at the 90th percentile. Therefore, immigration held back real wages by 0.47 pence and 0.64 pence per year at the 5th and the 10th percentile, while it contributed 1.68 pence per year to real wages at the 90th percentile. The effect on mean wages is insignificant and very close to zero, as shown in Table A2 in Appendix.

These findings suggest that immigration has slightly widened the native earnings distribution by decreasing wages at the bottom and increasing wages at the top. Moreover, immigration also affects the overall earnings distribution through composition effects, which is what we discuss in the next section.

5. Inequality and Immigration

5.1 The effect of immigration on wage inequality in the receiving country

There are two ways immigration can affect wage inequality in the receiving country. First, it can change the distribution of resident wages as a result of changes in wages (as discussed above). Second, it can change the composition of the overall population. In this section, we

discuss these two channels, and decompose immigration's impact on wage inequality into these two components.

[FIGURE 13]

We start with a simple example. Suppose there are two labour types, unskilled and skilled, with initial numbers N_U and N_S in the native population of total size N. Wages are initially w_U for the less skilled type and w_S for the more skilled type where $w_S > w_U$ (and we assume away differences in hours). Thus, the average wage is $\bar{w} = (w_U N_U + w_S N_S)/N$. The Lorenz curve for earnings – showing cumulative shares of total wages as we move up the wage distribution - is, say, L_0 in Figure 13.

- Suppose that immigration brings an inflow of low skilled workers. Factor prices adjust so that w_U falls relative to w_S and the Lorenz curve among native workers shifts outward to L_1, indicating an increase in inequality among the population of native workers.

- However, immigration itself introduces a group of new unskilled workers into the population so that the share of lower paid in the total population is higher and the average wage in the total population lower than in the solely native population. The Lorenz curve for the whole population, including immigrants, is at L_2. Comparing to L_1, both sections of the Lorenz curve have a higher slope because of the lower average wage but the point at which the slope changes has moved rightward.

Nonetheless, as drawn, the final Lorenz curve L_2 remains wholly outside the original Lorenz curve L_0, indicating an unambiguously higher inequality in the final population than in the original population

[FIGURE 14]

With a more complex array of labour types and immigration bringing inflows into each of them, the effect on the Lorenz curve will be correspondingly more complex but still composed

of a multiplicity of effects of this type. The impact of immigration on native wages along the distribution (as earlier illustrated in the bottom panel of Figure 12) will steepen or flatten the Lorenz curve depending on whether the proportional change is greater or less than the average and the position of immigrants in the native wage distribution (as earlier illustrated in the top panel of Figure 12) will contract or expand the population proportions of wage types along the lower axis depending upon where immigrants are more and less concentrated than natives. These effects are illustrated in an abstract example in Figure 14.

- In the bottom left panel, we see wage effects illustrated along the distribution. As illustrated, they are negative at top and bottom and positive in the middle. The slope of the Lorenz curve for natives (in the panel above) is correspondingly depressed at top and bottom and pushed upward in the middle, as indicated by the arrows. As a consequence, the final Lorenz curve for the native population crosses the original one as shown.

- In the bottom right panel, we see the location of immigrants in the native wage distribution. As drawn, they are concentrated at the top and bottom and sparse in the middle of the wage range. Moving from the distribution among natives to the distribution among the whole population including immigrants, the Lorenz curve is compressed horizontally where immigrants are rare and expanded horizontally where they are more common as shown in the top panel. The final Lorenz curve for the whole population accordingly crosses that for natives alone as shown.

To estimate changes in the Lorenz curve induced by wage effects for the UK over the period 1994-2016, we use the estimates of the wage effects of immigration along the native wage distribution, which we presented in Section 4, to draw Figure 15 which corresponds exactly to Figure 14 but using real data. The bottom left panel is taken from Figure 12, while the bottom right panel illustrates the density of newly arrived immigrants along the native wage

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distribution, as first presented in Figure 10. Because of the size of the effects and the smallness of immigrant numbers the shift in Lorenz curves in the upper panels are barely visible. We can conclude from these figures that the total impact immigration has had on overall inequality in wages, judged in terms of areas on Lorenz diagrams, is indeed very small (though it is rare to see appreciable movements in Lorenz curves for any reason).

[FIGURE 15]

Wages are only part of income and individuals may also receive income through other factors, such as capital or land, the prices of which may be influenced by immigration. Assuming that these other factors are complementary to labour of the arriving types then increases in their returns will benefit any native owner. The distributional effect will depend upon where these owners are concentrated in the income distribution. If, for example, owners of capital or land tend to be better off than those whose income comes principally from sale of labour then this will aggravate any inequality-worsening effect of immigration.

5.2 Decomposing inequality

To summarise the total impact of immigration on inequality we can calculate the effect on any of the many possible indices of inequality. Choosing a measure decomposable across subpopulations allows a breakdown of any impact into effects within and between natives and immigrants.

The Theil index (calculated as the difference between the log of arithmetic and geometric mean wage) is one example of such an index. Its decomposability allows the impact of immigration on inequality to be broken up into its different aspects.

Let N_i and M_i be the numbers of native and immigrant workers of labour type i, N and M be the total numbers of natives and immigrants respectively, m be the share of immigrants in the population $M/(N + M)$, w_i be the wage of type i and w be the vector of wages of all types.

The Theil index $T(\boldsymbol{w})$ is the difference between the log of the arithmetic mean $\overline{w}$ and geometric mean $\widetilde{w}$:

$$T(\boldsymbol{w}) = \ln\left[\frac{1}{N+M}\sum_i(N_i+M_i)\,w_i\right] - \frac{1}{N+M}\sum_i(N_i+M_i)\ln w_i = \ln\overline{w} - \ln\widetilde{w}.$$

It easily decomposes into

$$T(\boldsymbol{w}) = T^N(\boldsymbol{w}) + m(T^M(\boldsymbol{w}) - T^N(\boldsymbol{w})) + T^B(\boldsymbol{w})$$

where $T^N(\boldsymbol{w})$ and $T^M(\boldsymbol{w})$ measure inequality among natives and immigrants respectively

$$T^N(\boldsymbol{w}) = \ln\left[\frac{1}{N}\sum_i N_i\,w_i\right] - \frac{1}{N}\sum_i N_i\ln w_i = \ln\overline{w}^N - \ln\widetilde{w}^N$$

$$T^M(\boldsymbol{w}) = \ln\left[\frac{1}{M}\sum_i M_i\,w_i\right] - \frac{1}{M}\sum_i M_i\ln w_i = \ln\overline{w}^M - \ln\widetilde{w}^M$$

and $T^B(\boldsymbol{w})$ is inequality between natives and immigrants (defined as the value of the index if all immigrants and natives each earned the mean wage of their group)

$$T^B(\boldsymbol{w}) = \ln\overline{w} - (1-m)\ln\overline{w}^N - m\ln\overline{w}^M.$$

If immigration is small then m is small and inequality will comprise mainly inequality among native workers $T^N(\boldsymbol{w})$.

We can use this decomposition to think separately about the ways in which arrival of immigrants affect inequality.

Suppose that wages in the absence of immigration would be $\boldsymbol{w}^0$. Then wage inequality without immigration would be $T^N(\boldsymbol{w}^0)$ and the effect of immigration on inequality would be

$$T(\boldsymbol{w}) - T^N(\boldsymbol{w}^0) = [T^N(\boldsymbol{w}) - T^N(\boldsymbol{w}^0)] + [m(T^M(\boldsymbol{w}) - T^N(\boldsymbol{w})) + T^B(\boldsymbol{w})]$$

The effect has two components (corresponding to the two aspects of the effect discussed in the previous section).

- Firstly, there is the effect on inequality in the native population through changes in the rewards to different labour types $[T^N(\boldsymbol{w}) - T^N(\boldsymbol{w}^0)]$. It is through this term that changes in native wage inequality arising through changes in factor prices will be captured.

- Secondly, if immigrants differ from natives in the distribution of wages, then there will be a compositional effect $[m(T^M(\boldsymbol{w}) - T^N(\boldsymbol{w})) + T^B(\boldsymbol{w})]$. This arises either because average wages differ so that $T^B(\boldsymbol{w}) > 0$ or because inequality within the immigrant subpopulation differs from that in the native population so that $T^M(\boldsymbol{w}) \neq T^N(\boldsymbol{w})$.

[FIGURE 16]

Figure 16 illustrates the evolution of the Theil index measuring wage inequality in the UK from 1994 to 2016, where the solid blue line represents the overall inequality index, the dotted red line the index for natives, and the green dashed line the index for immigrants. In accordance with the decomposition outlined above, the solid blue line is a weighted average of the red and green lines plus the index for inequality between immigrants and natives. The last of these is in our case very small and is omitted from the graph. From the figure we see that overall wage inequality (solid blue line) is consistently decreasing from 2000 onwards. Wage inequality among natives (dotted red line) is consistently lower than among the immigrant group (dashed green line) so that the compositional effect of including immigrants in the population raises inequality. The total magnitude of the compositional effect is the difference between the solid blue and dotted red lines.

In Table A3 in the Appendix, we give our estimates for the detailed decomposition of the Theil index. In the third and fourth columns we present our estimates for the Theil indices on wage inequality within the groups of natives and immigrants respectively. In the fifth column we see that, as mentioned above, between-group inequality, expressed as the difference between mean immigrant and mean native wage, does not seem to significantly add to wage inequality

overall. Comparison of the fifth and sixth columns makes plain that inequality between immigrants and natives is of small, and often very small, importance in this regard compared to the difference in inequality within immigrant and native populations.

Moreover, as shown in the previous section, immigration also stretches the earnings distribution of the natives. Consequently, immigration further contributes to the rise in overall wage inequality by increasing wage inequality within the group of native workers.

5.3 Percentile ratios

In the last part of this section, we take a closer look at the evolution of wage inequality in the UK as documented in the previous section both across and within native and immigrant groups. We focus on the evolution of hourly wages at the 10th, the 50th and the 90th percentile of the overall, native and immigrant wage distributions.[19] Based on the Theil index, we have shown in the previous section that even though wage inequality consistently decreased from 2000 onwards both across and within the two groups, wage inequality among immigrants was systematically higher than wage inequality among natives. This pattern can also be seen when measuring wage inequality for the UK during the same period using the 90-10 ratio (upper panel Figure 17).

[FIGURE 17]

Decomposing these movements into those above and below the median reveals some interesting differences between the two groups (see Figure 17). While for natives inequality decreased both above and below the median, for immigrants, the 90-50 ratio first increases (until about 2012) and then decreases, while the 50-10 ratio decreases since 2000. Thus, the overall decrease in wage inequality was driven by a significant reduction of wage inequality at

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[19] Our focus on the 90th and 10th percentiles misses out on movements at the very top of the distribution. Advani et al. (2020), using administrative tax data, show that immigrants are heavily over-represented at the very top of the income distribution, and concentrated in the finance sector. They conclude that 85% of the growth in the UK top 1% income share over the past 20 years can be attributed to migration.

the bottom half of the wage distribution, which overcompensates the increase in wage inequality in the top half of the wage distribution.

Figure 18A illustrates that the reduction in wage inequality at the bottom half of the immigrant distribution is mainly driven by a persistent increase in the wage at the 10th percentile of the immigrant distribution that started towards the end of the 1990s. As wages at the 10th percentile of the native distribution experienced the same, or even slightly greater, increase too (see Figure 18B), this is likely to be driven by subsequent rises of the minimum wage during this period. Lindley and Machin (2013) illustrate that the National Minimum Wage (NMW) grew faster than average earnings in the UK during the period 1999-2010. They argue that this significantly benefited female workers at the lower end of the wage distribution, leading to a substantial reduction in lower-tail wage inequality.[20] This is in line with our findings in Figure 17, where the 50-10 ratios for both native and immigrant workers have been declining during the same period, even though the downward trend has been more persistent for immigrants.[21]

[FIGURE 18A | FIGURE 18B]

6. Other Effects on Inequality and Immigration Attitudes

So far, effects through affecting the distribution wages were the primary focus of this paper. However, immigration can affect inequality also in other dimensions.

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[20] Lindley and Machin (2013) show that the rises in NMW benefited female more than male workers at the bottom of the distribution during 1999-2010. For immigrants, we find that both female and male wages at the 10th percentile of the immigrant distribution rose by the same amount.

[21] The downward trend in the 50-10 ratio has been more persistent for immigrants, even though native wages rose more than immigrant wages at the 10th percentile of the distribution, because the native median wage rose more than the immigrant median wage during this period.

6.1 Fiscal Effect of Immigration

One such channel is through fiscal effects. Immigrants pay taxes and impose a burden on public finances through use of public services and consumption of publicly provided goods in ways that can relax or tighten the government's fiscal position in destination countries (Preston 2014). Since net fiscal contributions of individuals depend upon demographic type and on economic position, the balance will depend upon the age and labour market position of immigrants at arrival and on the way in which demographic and economic status evolves over the duration of immigrants' period in the receiving country, as discussed in earlier sections. There is no general answer as to whether immigration should affect public finances negatively or positively, though the best accounting for the UK points to a clear overall fiscal gain.

Dustmann and Frattini (2014), in an assessment over the period between 2001 and 2011 of all immigrants who arrived in the UK since 2000, find that their net fiscal contributions have been positive throughout, and particularly so for immigrants from EEA countries. Breaking down different immigrant groups further, they note the strong positive contribution made by immigrants from countries that joined the EU in 2004 – a finding that contrasted sharply with claims in some of the media and in public debate at the time.[22] Over the same period, the net fiscal contribution of natives has been negative on average, in line with the overall deficit the UK ran during this time. Reasons for the overall positive fiscal contributions of immigrants are among others their higher labour market participation and their lower receipt of benefits and transfers.

The policy question which analysis by Dustmann and Frattini (2014) addresses is "*what is the net fiscal contribution of immigrants who arrived between years 2001 and 2011 over that same period*". By focussing on cohorts who are observed in the data since arrival, their analysis is

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[22] *"Economic migrants need schools for their children. They need housing. They need medical care. They can even lose their jobs" - Daily Mirror, 24 July 2006; "Jobs dry up but Poles stay to reap the benefits" Daily Mail, 9 January 2009*

transparent and does not require strong assumptions. However, it has little to say about immigrant's net fiscal contributions are *over their entire migration cycle*. This question is addressed in work by Dustmann et al. (2022) who add a dynamic and forward-looking element that adds, to all past contributions, predictions of future contributions for cohorts who arrived in the UK after 2004. They thus address issues such as aging of immigrant cohorts, which may lead to more welfare reliance in future but will also capture immigrants' future income growth. Moreover, their analysis accounts for outmigration, which leads immigrants to contribute when young, but to leave the country when older and less productive. Their analysis finds likewise a substantially positive net fiscal contribution of immigrants not just over the observation window of the data, but over their entire migration cycle, which is again particularly large for immigrants from EU countries.

While these studies draw therefore a positive picture of immigrants' net fiscal contribution, the fact that immigrants pay on average more than enough in taxes to cover the cost of the burdens that they impose on the public sector does not mean that the fiscal effects will not be differentially spread across the resident population. How the government responds to the beneficial effect on public finances will be the consequence of political choice. Any increase in public spending need not be concentrated on those services most affected by the burdens imposed by immigration and, since the benefits of different items of public spending are not similarly spread across the population, the net effect on the lives of different groups within the population may differ.

Furthermore, while most taxes are paid into the central exchequer, much of public service delivery is local and adjustments to public spending need not match the geographic pattern of immigration with the consequence again that the net impact may be uneven. Health, education and policing are all, for example, public spending items delivered locally which could be affected by immigration. While economic evidence does not support the fears often expressed

in public discourse that migrants impose disproportionate burdens on any of these services, it will inevitably be true that those burdens which are imposed will be correlated spatially with immigration and any instances of immigration concentrated in poorer areas and unmatched by appropriate redirection of public funds could aggravate inequality.

An example is government spending in the UK on services such as health, social care, education and policing in the 2000's. Although immigrants who arrived in the 2000's paid more in terms of taxes than they received in transfers and benefits (see Dustmann and Frattini 2014), they naturally increased demand for certain publicly provided goods and services in localities where they were concentrated (see discussion on impact of immigration on public spending in Preston (2014)). This, in conjunction with austerity programmes introduced after the Great Recession and reductions in public spending on social care, policing and health services, may have led to local supply problems. Immigration was typically blamed for shortages of service provision[23] (not just by part of the press, but also by politicians, keen to deflect responsibility for the hardship austerity imposed on some; "When immigration is too high… it's difficult for schools and hospitals and core infrastructure like housing and transport to cope." – Theresa May, Conservative Party Conference 2015).[24] Thus, while immigrants (in contrast to natives) paid more in terms of taxes than they received in transfers and benefits over the period, shortfalls in service provision due to overall austerity cuts and failure to allocate funds locally according to demand and population projections may have disadvantaged some.

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[23] See, e.g., https://theconversation.com/blame-austerity-not-immigration-for-taking-britain-to-breaking-point-61133;https://www.independent.co.uk/news/uk/politics/austerity-not-immigration-to-blame-for-inequality-underlying-brexit-vote-argues-professor-a7127751.html.

[24] Similar arguments were expressed in popular press as well: "Net migration at that volume… puts pressure on infrastructure, such as housing and transport – and public services, such as schools and hospitals." (The Times, 29 August 2015) or "Theresa May must cut immigration to reduce pressure on public services and give hard-working Brits a pay rise" (The Sun, 16 August 2016).

6.2 Perceived Disadvantage and Attitudes towards Immigration Policies

While the empirical evidence shows clearly that effects on the resident population through labour market competition or fiscal impact are on average small or positive, these effects may however be perceived differently by different population groups. Is it the case that those groups that are more likely to compete with immigrants are also more hostile towards immigration, and are those who are competing with immigrants for public funds, or whose tax contributions fund welfare payments, more critical about immigration? Are differences in attitudes across different groups explained by perceived economic disadvantage arising from immigration? Or are other factors, such as objections to cultural change or racial prejudice against arriving immigrants, dominant in the way attitudes towards immigration and immigration policies are formed? These are important questions as they help to understand better how governments can balance the need of industry for immigrant labour with the resistance to immigration among some in the resident population.

Dustmann and Preston (2005), in a study of views of UK residents on the economic effects of immigration, compare concern about labour market competition or public finances in explaining views as to whether immigration is good or bad for the economy. To elicit what economic theory would predict about the formation of such views across different groups, they first develop a simple equilibrium model that illustrates that immigration can impact on natives in several ways. First, by altering labour market outcomes if the skill mix among immigrants differs from that of the current workforce, and if the economy reacts to changes in the skill mix through wage adjustments - effects discussed in previous sections. Secondly, by immigration increasing or alleviating the tax burden. If immigrants contribute less through taxes and/or consume more out of public services than residents, then the implied additional tax burden may fall more heavily on the rich, creating therefore distributional effects in earnings after taxes. Such effects may be aggravated by possible employment effects potentially increasing the tax

burden for the economically active in the resident workforce. Thus, consideration about benefit and cost from immigration should include not only labour market competition, but also taxes and public burden, as well as general welfare effects determined by efficiency considerations. All these may impact differently on different groups in the population and could explain differences in the formation of views about immigration's economic effects. Their empirical analysis suggests that concerns regarding economic competition are dominated by fears about public finance burden, with the latter being particularly salient among the better off. They also illustrate a strong relationship between education and more positive attitudes towards various issues relating to migration.

The association between hostility to immigration with certain indicators of respondents' economic status, in particular with education, is well-established across many surveys in many countries (Hainmueller and Hopkins 2014). Early work (Scheve and Slaughter 2001) regarded this as evidence for a harsher impact of immigration on the less-advantaged, compatible with labour market competition disadvantaging those who compete with immigrants as discussed earlier. This explanation is however difficult to reconcile with deeper investigation of correlations within survey data or with experimental evidence.

An example of such work is Dustmann and Preston (2007), who aimed at understanding whether racial and cultural concerns about immigration may impact views about immigration policies. They distinguish between three channels that determine attitudes to further immigration: labour market concern, welfare concern, and racial or cultural concern. Based on data from the British Social Attitudes Survey from 1983-90, they compare the relative magnitude of association of attitudes to further immigration of the three channels across immigrant groups of different origin. In line with Dustmann and Preston (2005) using the same data, they show that welfare concerns appear to be a more important driver of attitudes than labour market concerns. This is particularly the case in groups with a high welfare dependence,

but strongest among respondents who are likely to be the biggest contributors if immigration induces a tax-financed increase in welfare dependency. Moreover, they show that opposition towards further immigration is strongly related to the proposed origin of immigrants, with much larger resistance the more ethnically distinct the immigrant population is. The presence within the data of questions directly addressing aspects of racial prejudice allows investigation of its role in attitude formation[25]. Racial prejudice turns out to be not only a very important component to attitudes towards immigration on average but is especially pronounced for immigration from countries with ethnically different populations. Racial prejudice is also particularly important as an underlying channel that drives overall attitudes for the low skilled, suggesting that the divide in attitudes toward further immigration between the high- and low educated is due to differences in racial prejudice rather than economic concern.

Card, Dustmann and Preston (2012) study these questions in more detail. They draw on excellent data from the European Social Survey in 2002 (covering 21 European countries) that stemmed from a purpose-built questionnaire supplement developed by the same authors to elicit the drivers to attitudes towards immigration, (see Card, Dustmann and Preston (2005)). In this survey, questions were asked dealing directly with the cultural consequences of immigration – its effect on social tensions, its effect on cultural richness and the desirability of social homogeneity in several dimensions. Distinguishing between economic (combining fiscal and competition concerns) and cultural concerns, they find that expressions of cultural concern are considerably more strongly (by a factor of 3 to 5) associated with attitudes towards a more or less lenient immigration policy than are economic concerns. Moreover, they establish

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[25] Questions concern personal acceptability of racial intermarriage within families and of having a racial different superior at work and self assessed racial prejudice. Specifically: "Do you think most people in Britain would mind (or not mind) if one of their close relatives were to marry a person of Asian / West Indian origin? ... and you personally? Would you mind or not mind?"; "Do you think most people in Britain would mind (or not mind) if a suitably qualified person of Asian / West Indian origin were appointed as their boss? ... and you personally? Would you mind or not mind?"; "How would you describe yourself? As very prejudiced against people of other races, a little prejudiced, or not prejudiced at all?"

that the greater antipathy to immigration of less educated respondents is poorly explained by economic concern but more strongly by differences in cultural conservatism. In line with these findings, and surveying a large literature, Hainmueller and Hopkins (2014) conclude that the hypothesis of labour market competition as an explanation for attitudes is a repeatedly disproven "zombie theory".

This suggests that the way immigration impacts on different groups of natives through labour market competition or its fiscal consequences only partly affects individuals' views on immigration policy. While there is some evidence that those who may feel competition from immigrants in the labour market or for transfers and benefits, and those who feel the tax burden of any negative fiscal effects, are more concerned about immigration, these channels are overshadowed by racial and cultural concerns. Thus, if one were to design migration and redistribution policies that reflect the costs and benefits which immigration brings to different groups, one is faced with three challenges. First, immigration's economic and fiscal effects may be positive, but any such gain needs to be redistributed in a way that compensates those who may lose from immigration. Our discussion of the fiscal effects of immigration and the access to public services illustrates that. Secondly, whatever careful assessment of evidence may suggest about immigration's economic gains and costs, this may not be reflected in common perception and such perception may respond slowly if at all to dissemination of research. Thirdly, the influence of perceived economic and fiscal consequences of immigration may have only limited influence on how individuals form their attitudes about what immigration policy should look like. Instead, evidence suggests that such views are more associated with racial and cultural concerns.

Why individuals form views about immigration that are less related to differences in immigration's economic consequences, but are more reflective of cultural concerns, is of course a key question. Similarly, why are such non-economic concerns differently established

across different groups? One reason may be differences in intensity or type of exposure to immigrants experienced by different groups, with the more educated having contact with (more educated) immigrants and thus being more likely to be positively oriented and feeling less competitive anxiety. Another reason may be social desirability bias that is differently pronounced across different groups such as the more and less educated - see e.g. work by Creighton, Jamal and Malancu (2015).[26] Understanding the factors that are not economically motivated but contribute to the formation of attitudes to immigration is of key importance, in particular in view of immigration being a dominant agenda item for right wing populist parties (see, e.g., Dustmann, Vasiljeva and Damm 2019).

7. Conclusions

In this paper we investigate the relationship between immigration and inequality in the UK over the past forty years. Over this period, the share of foreign-born individuals in the UK rose from 5.3% in 1975 to 13.4% in 2015, with a significant increase in the share of those born in A8 countries between 2005 and 2015. Work and family reunification have been the most common reasons behind immigration of EU nationals, while inflows of non-EU nationals have been largely driven by study purposes. We document that immigrants have been systematically better educated than natives in the UK throughout the forty years of our observation period. Nevertheless, in line with DFP (2013), we find that immigrants downgrade upon their arrival in the UK by working in jobs that are in substantially lower earnings categories than where they would be allocated based on their education alone. We provide evidence that as immigrants spend more time in the UK and acquire complementary skills or transfer their

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[26] Social-desirability bias is a bias that results from survey respondents answering questions in a way that that will be favourably viewed by others.

existing skill sets to the particularities of the UK, they move to jobs higher up in the earnings distribution.

As for the interplay between immigration and inequality, we find that immigrant inflows to the UK between 1994 and 2016 very mildly stretched the native earnings distribution. We also illustrate that wage inequality among immigrants was systematically higher than wage inequality within the group of natives throughout the period 1994-2016, so that inequality in the population including immigrants was slightly higher than in the population of natives alone. However, the overall effects of immigration on inequality in the UK were very small.

Finally, we report that wage inequality in the UK significantly decreased from 2000 onwards both within the native and within the immigrant group. Examining the trend of these two groups in isolations reveals that while inequality decreased both at the top and at the bottom of the native earnings distribution, it increased in the top half of the immigrant distribution. This was because of decreasing median wages from the mid-2000s onwards, possibly linked to the numbers of less-skilled workers from the A8 countries after 2004. On the other hand, the decrease in the median wage together with an increase at the bottom decile of the distribution, likely caused by subsequent rises in the national minimum wage, led to a significant reduction in wage inequality among immigrants in the bottom half of the distribution. This reduction in wage inequality at the bottom overcompensated the increase at the top, with overall immigrant wage inequality consistently decreasing since the early 2000's.

Overall, therefore we conclude that immigration has had only very small effects on the distribution of native wages. Neither immigration's effect on the distribution of wages through inducing changes in the price of labour nor its effect through affecting the composition of the wage-earning population are at all sizeable. We also show that another channel – the impact of immigration on the fiscal budget, and the potentially unequal impact of the ensuing tax implications on natives – are, at least for the UK, not a factor that creates disadvantage as

immigrants are large net fiscal contributors. However, the distribution of the net fiscal benefits immigration brings is determined by politics, and non-response to demand fluctuations partly caused by immigration may lead to harmful consequences for some groups of natives. It is the responsibility of politicians, both locally and nationally, to appropriately respond to immigration induced changes in the demand for publicly funded goods and services.

Work that studies the impact possible expected distributional consequences of migration may have on attitudes shows that economic factors explain a small part of the gap between the well-educated (and therefore potential beneficiaries of immigration) and the less well educated. Evidence suggests this gap has more to do with racial and cultural concerns being differently felt across these groups.

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FIGURE 1A. Immigrants as percentage shares of the UK population
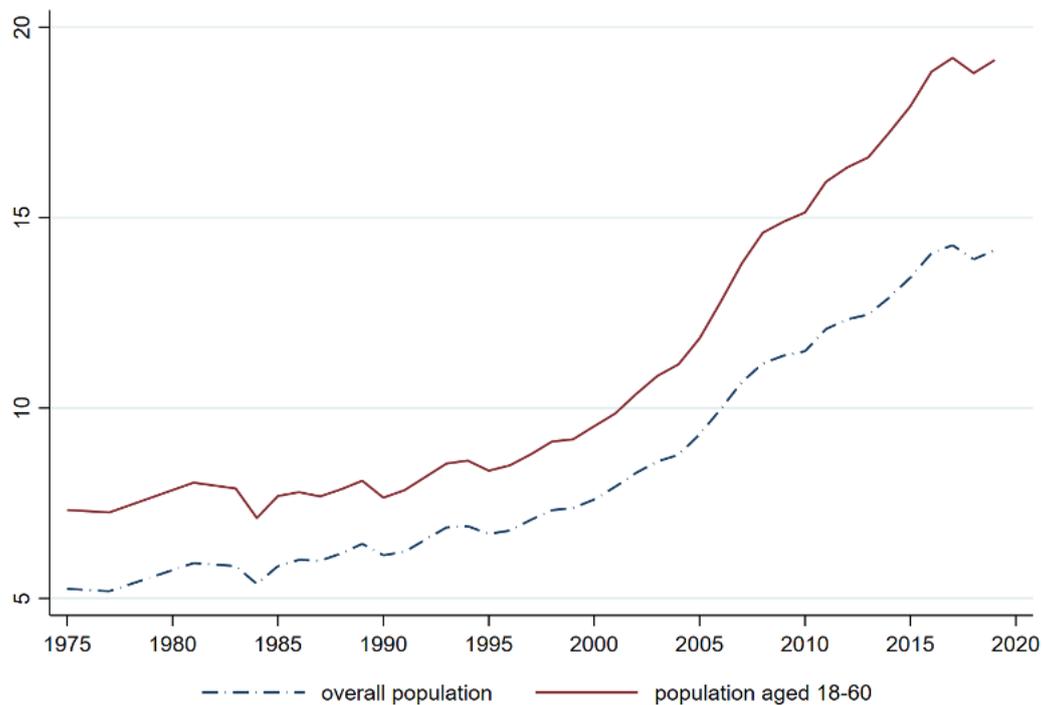
Note: The dash-dotted line illustrates the evolution of the share of immigrants of all ages over the overall UK population for the period 1975-2019. The solid line shows the evolution of the share of immigrants aged 18-60 over the UK population in the same age range for the same period. We define as immigrants all foreign-born individuals.

Source: UK LFS

FIGURE 1B. Immigrants as percentage shares of the UK population by age groups
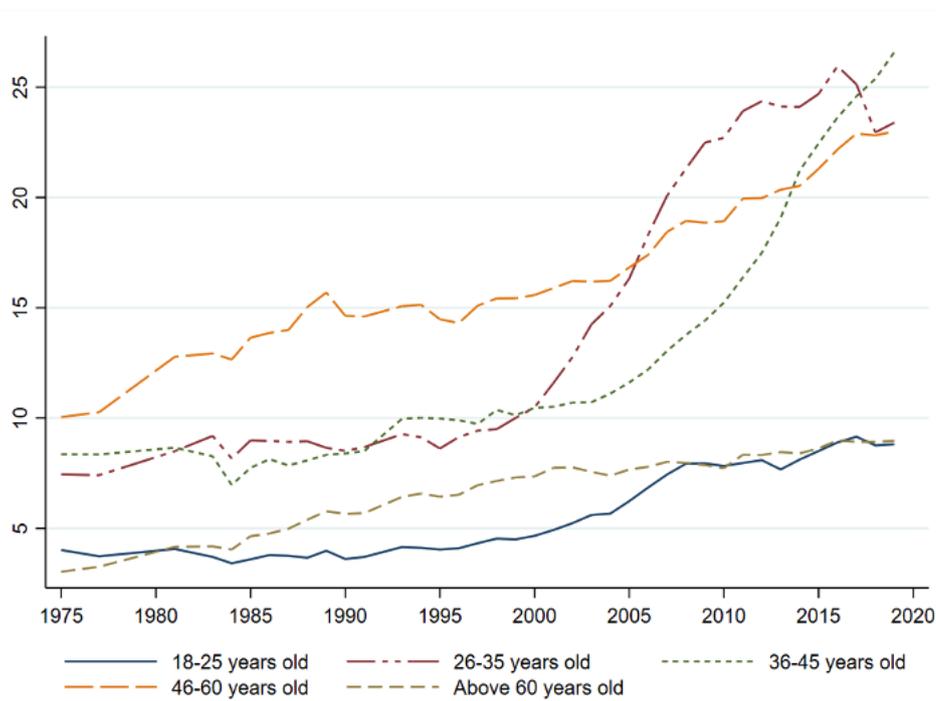
Note: This figure illustrates the evolutions of immigrant shares across five age groups over the UK population in these age groups for the period 1975-2019. We define as immigrants all foreign-born individuals. Source: UK LFS

FIGURE 2. Immigrants as percentage shares by country of birth
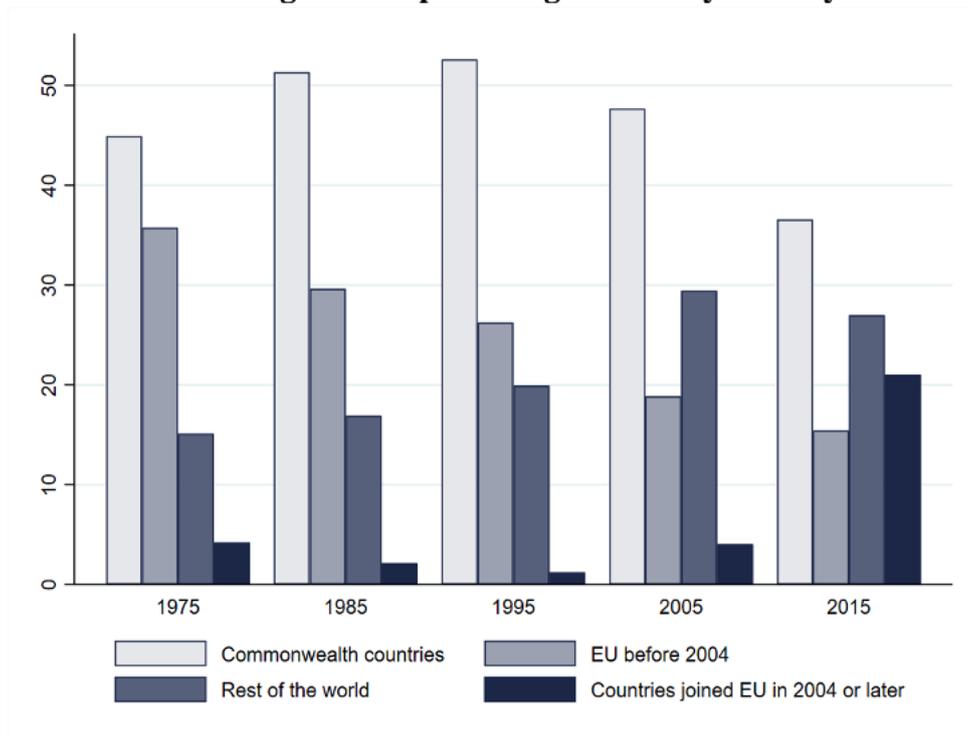
Note: The figure shows the percentage shares of immigrants from four groups of countries of birth within the immigrant population aged 18-60 in the UK. The first group includes the individuals born in a Commonwealth country. The second group consists of those born in countries that joined the EU before 2004, while the third group includes those born in countries that joined the EU in 2004 or later. The fourth group includes all other foreign-born individuals.

Source: UK LFS

FIGURE 3. Immigrant stocks by country of birth and nationality in the UK
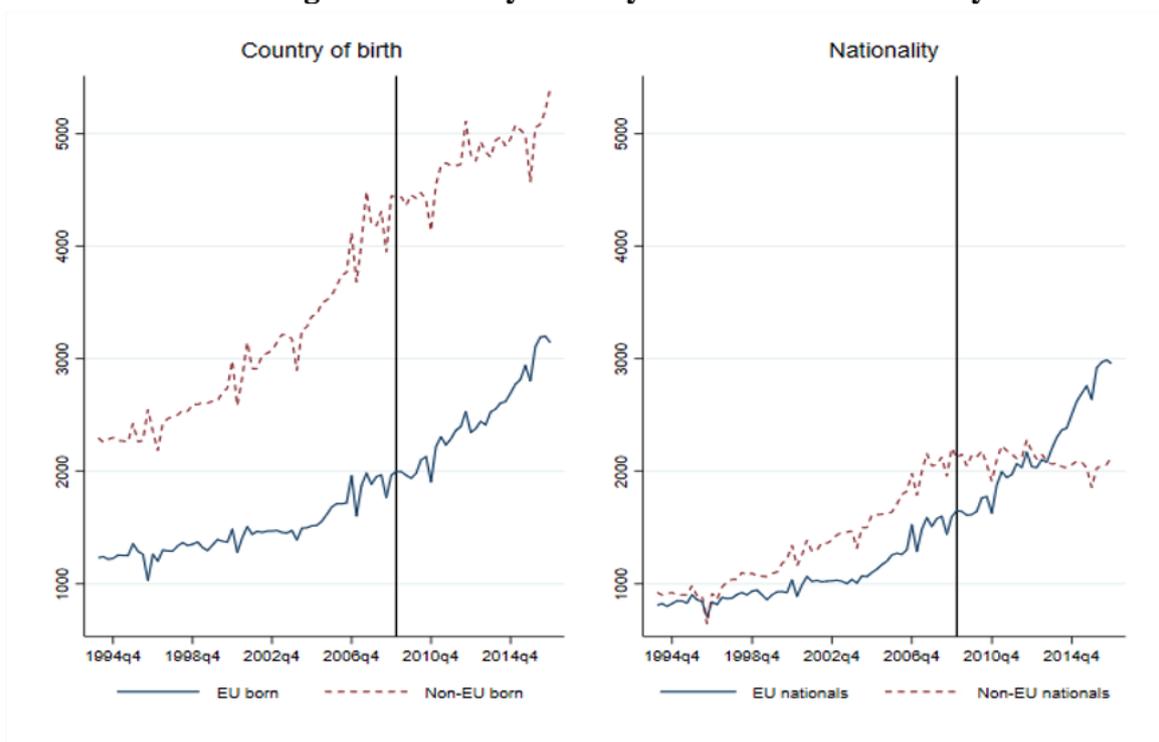
Note: The graph on the left illustrates the evolutions of the stocks (in thousands) of EU and non-EU born individuals aged 18 or over in the UK. The graph on the right illustrates the evolutions of the stocks (in thousands) for EU nationals and non-EU nationals aged 18 or over. The stocks are estimated for each quarter from the first quarter of 1994 to the last quarter of 2016. The vertical line shows as reference the first quarter of 2009.
Source: UK LFS

FIGURE 4. Net migration to the UK
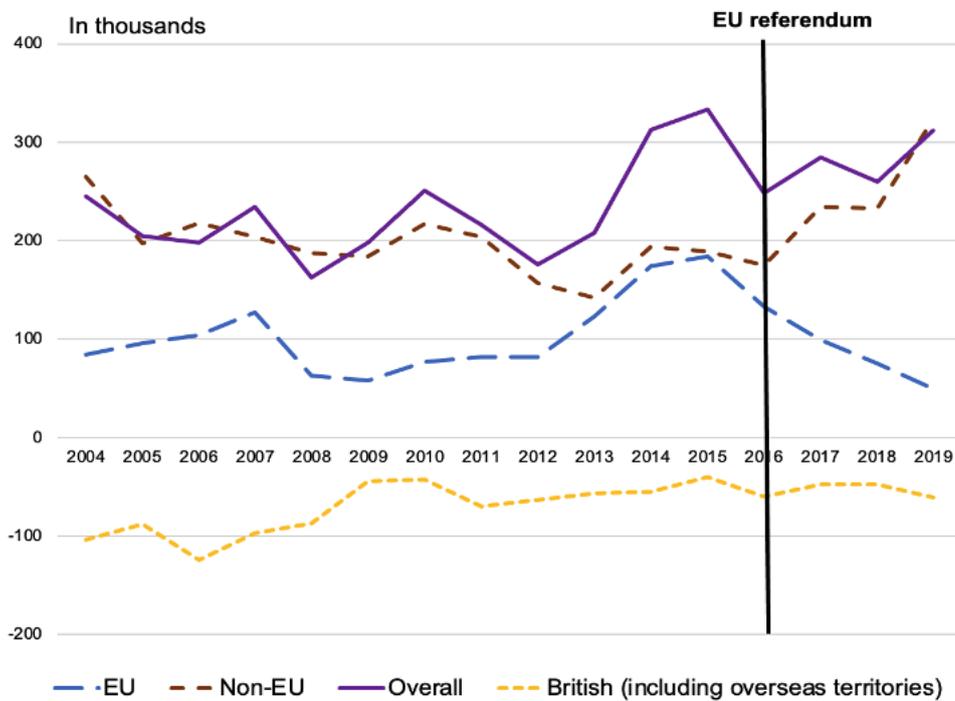
Note: This figure illustrates net migrant flows in the UK.
Source: ONS, Table 2.01a: Long-Term International Migration time series.

FIGURE 5. Survival rates of immigrants in the UK by citizenship
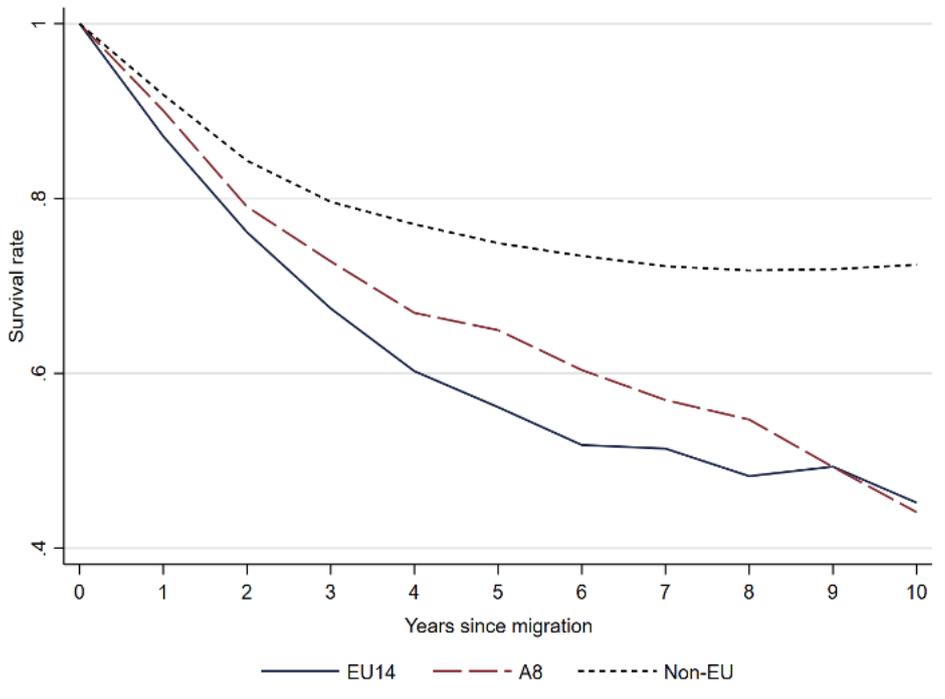
Note: The figure reports estimated survival rates of immigrants in the UK by passport-reported citizenship. Long-term immigrants are defined those who live for more than 12 months away from their usual residence. We focus on flows of immigrants arrived between 2005-2015 and left between 2006-2016.
Source: International Passenger Survey (IPS) - Long-Term International Migration (LTIM)

FIGURE 6A. EU inflows by reason for migration

In thousands

EU referendum

Work and Family reunification — — Study
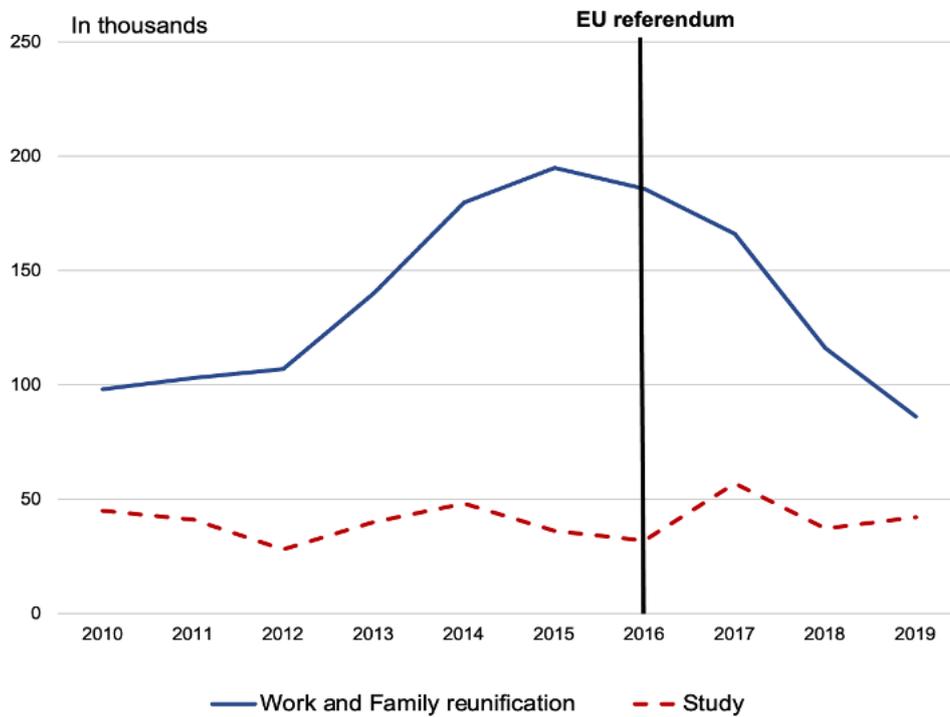
Note: The figure illustrates inflows of EU nationals for work and family reasons vs study in the UK.
Source: ONS, Table 3: Provisional long-term international migration estimates.

FIGURE 6B. Non-EU inflows by reason for migration
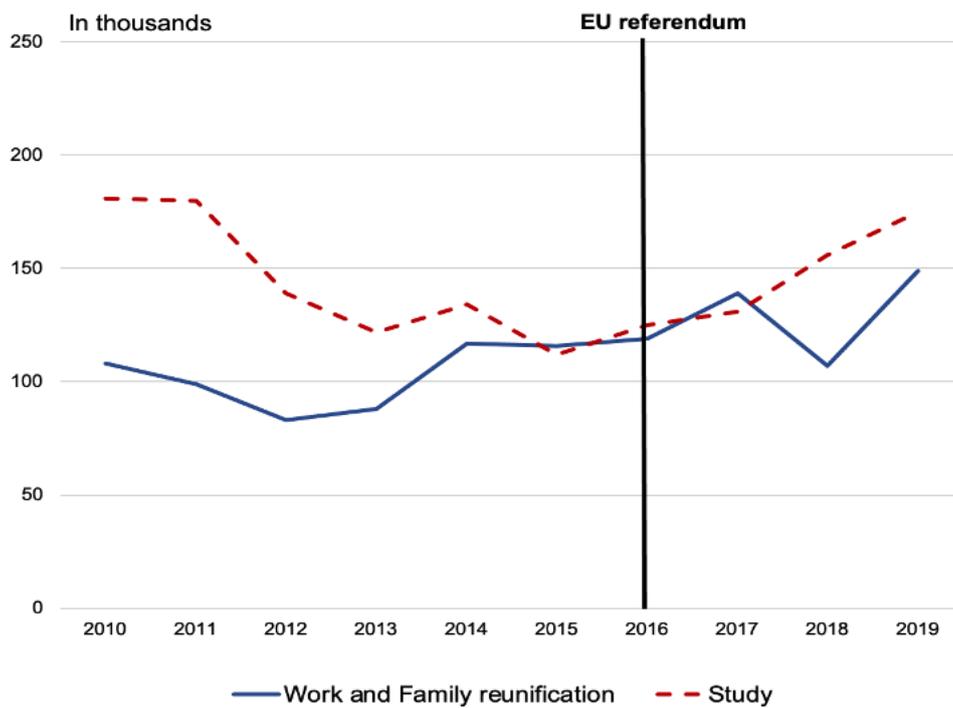
Note: The figure illustrates inflows of non-EU nationals for work and family reasons vs study in the UK.
Source: ONS, Table 3: Provisional long-term international migration estimates.

FIGURE 7. Total asylum-related grants in the UK
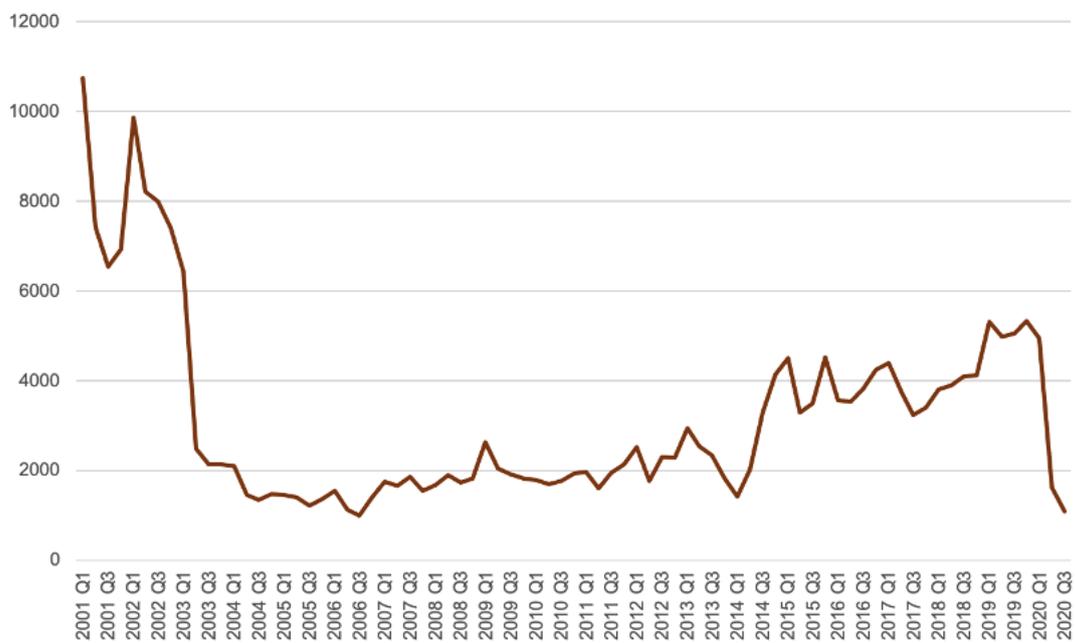
Note: The figure illustrates the evolution of the number of asylum-related grants in the UK from the first quarter of 2001 to the third quarter of 2020. Source: Home Office Immigration Statistics, Tables Asy_D01.

FIGURE 8. Educational attainment of immigrants and natives in the UK
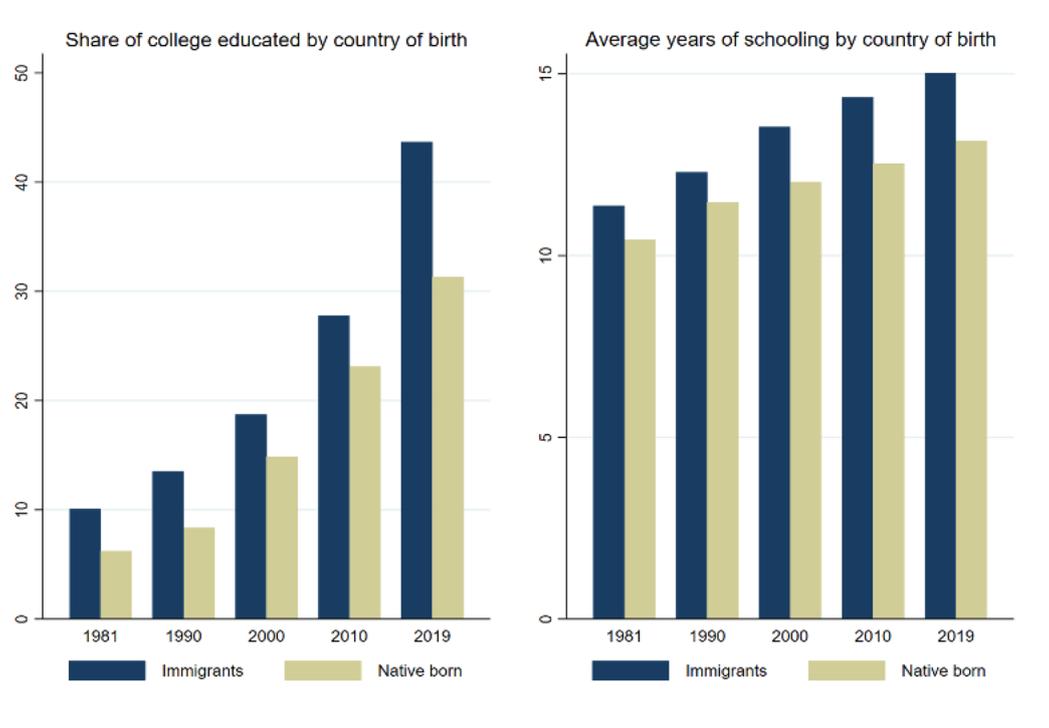
Note: The left graph illustrates the percentage shares of college educated (holding tertiary qualifications) immigrants and natives in the UK. The graph on the right illustrates the average years of schooling for the immigrant and native group. Immigrants are defined as foreign-born individuals.
Source: UK LFS

FIGURE 9A.
Positively selective immigration
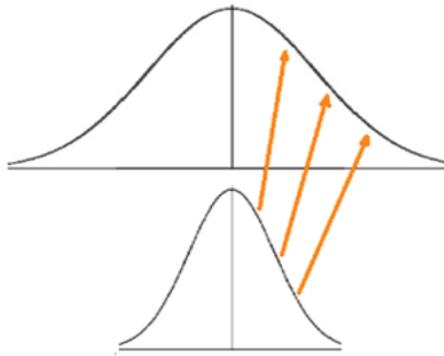
FIGURE 9B.
Negatively selective immigration
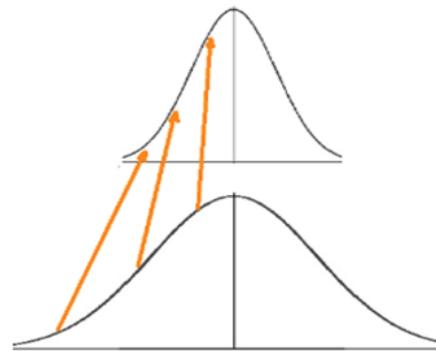
FIGURE 9C.
Immigration under "Non-hierarchical Sorting"
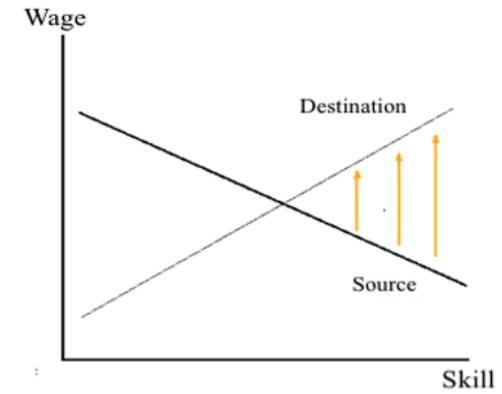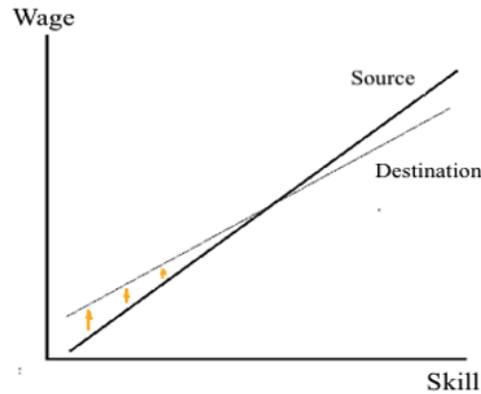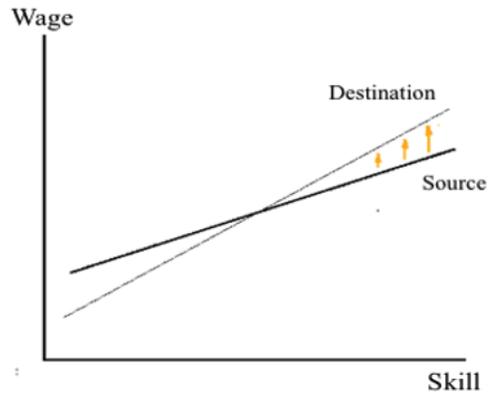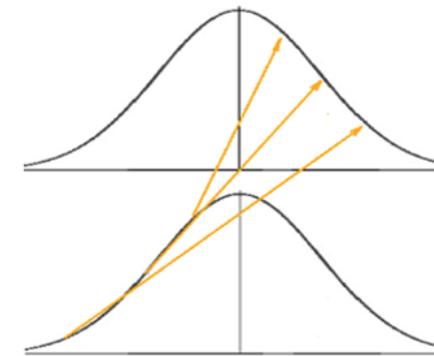
Note: The figures illustrate three cases of selectivity of immigration in a simple Roy model with only one dimension of skills. The top panels illustrate the distributions of earnings in the destination- (upper graphs) and the source (lower graphs) country. The bottom panel graphs show the relation between skills and wages in the destination- and the source country.

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FIGURE 10. Predicted and actual position of recent immigrants on the native wage distribution
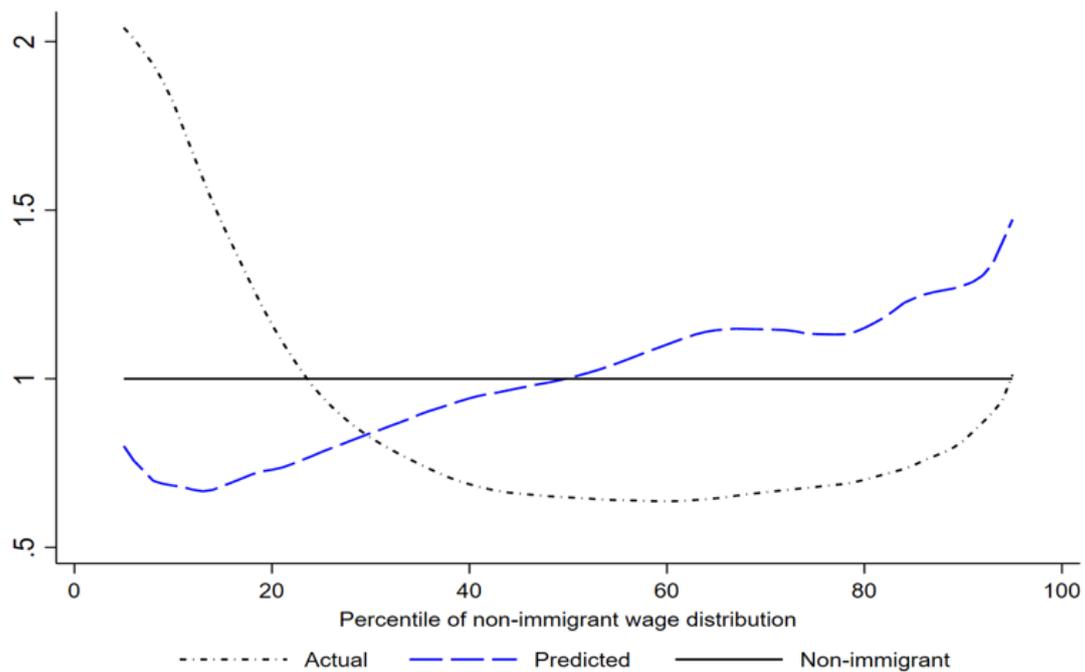
Note: The figure shows kernel estimates of the density (dotted line) and the predicted density (dashed line) of immigrants who arrived within the last 2 years in the non-immigrant wage distribution. The horizontal line shows as reference the non-immigrant wage distribution. The kernel estimates are above the horizontal line at wages where immigrants are more concentrated than natives and below the horizontal line at wages where immigrants are less conentrated than natives. Hourly wages are deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.
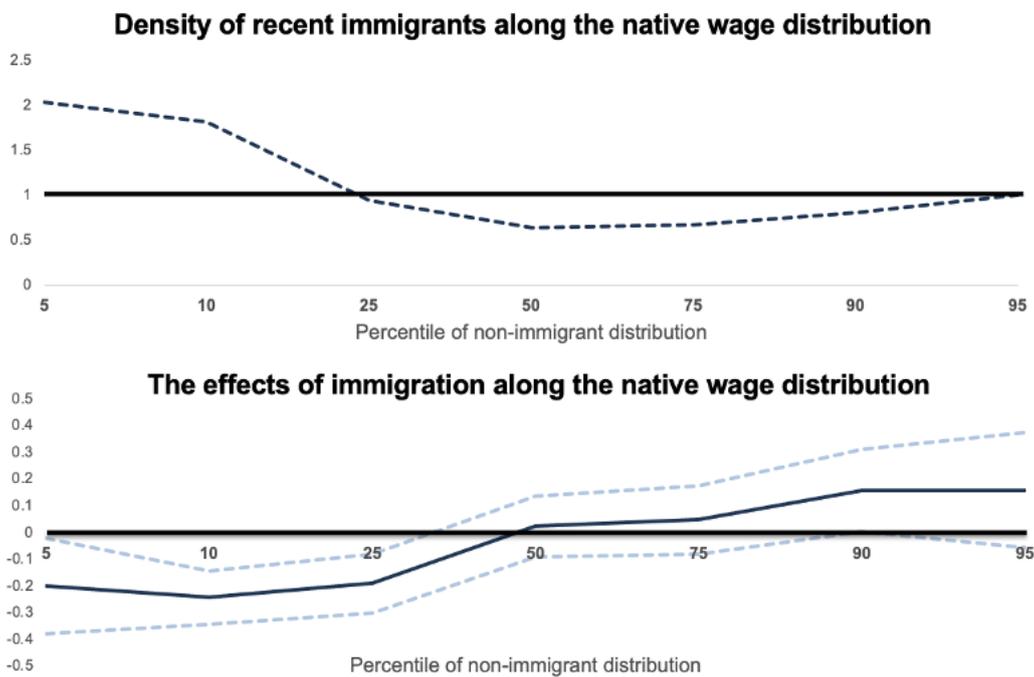Source: UK LFS 1994-2016

FIGURE 11. Densities of immigrant cohorts on the native wage distribution
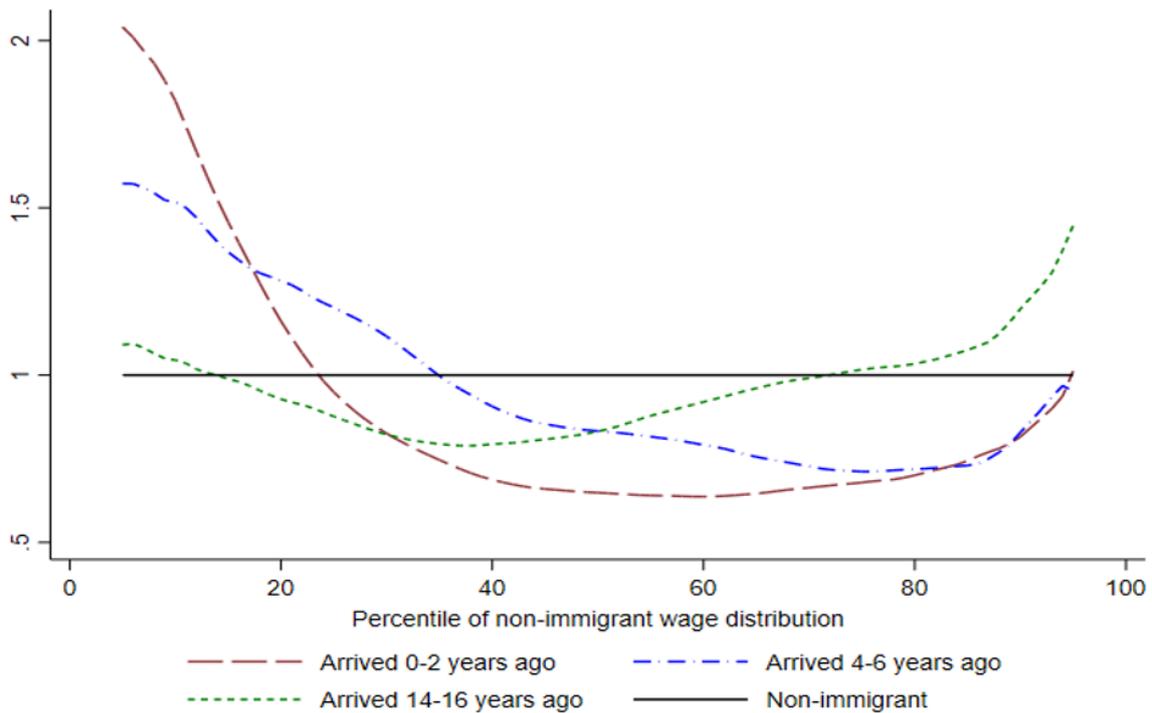
Note: The figure shows kernel estimates of the densities of immigrant cohorts that arrived 0-2, 4-6 and 14-16 years ago in the non-immigrant wage distribution. Hourly wages are deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.
Source: UK LFS 1994-2016

FIGURE 12.

Density of recent immigrants along the native wage distribution

Percentile of non-immigrant distribution

The effects of immigration along the native wage distribution

Percentile of non-immigrant distribution

Note: The top panel illustrates the kernel estimated density of immigrants who arrived within the last 2 years in the native wage distribution in the UK. The bottom panel shows the estimated effects of immigration along the native wage distiribution. The short-dashed lines in the bottom graph illustrate 5% confidence intervals.

Source: UK LFS 1994- 2016

**FIGURE 13. Immigration and the Lorenz curve (two labor types)**
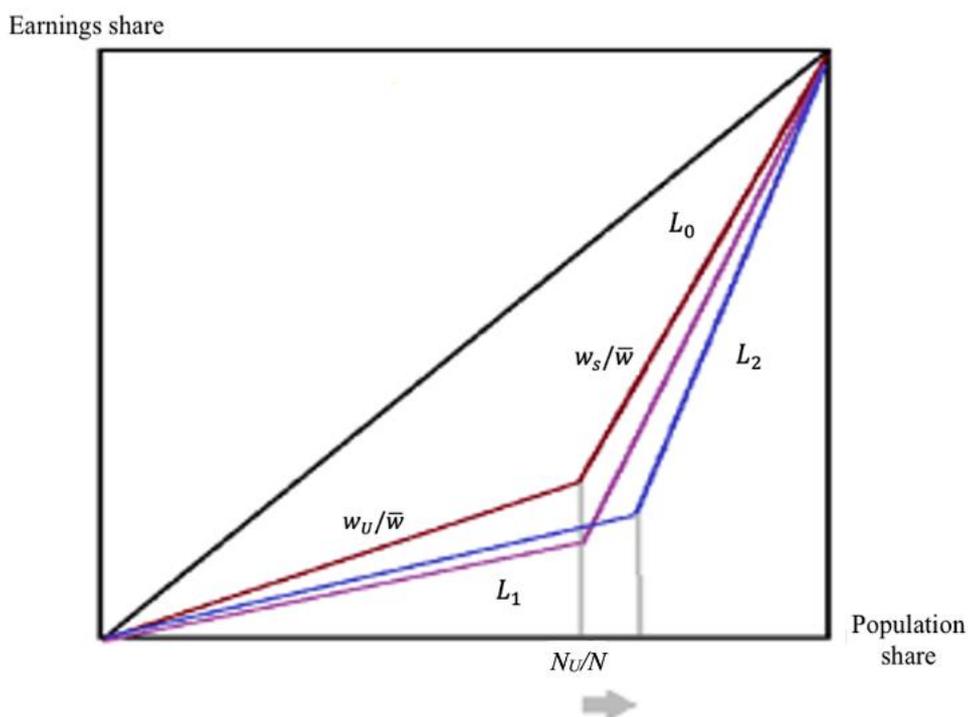
Note: The figure illustrates the change in the host country's Lorenz curve induced by an inflow of low-skilled immigrants in the simple case with only two types of workers, high- and low-skilled, in the labor force. The Lorenz curve for earnings before the arrival of the immigrant inflow is L_0. The arrival of the inflow decreased the wage of the less skilled type and the Lorenz curve shifted outward to L_1. Immigration also increased the share of less-skilled in the population and eventually the Lorenz curve is shifted to L_2.

**FIGURE 14. Immigration and the Lorenz curve (multiple labor types)**
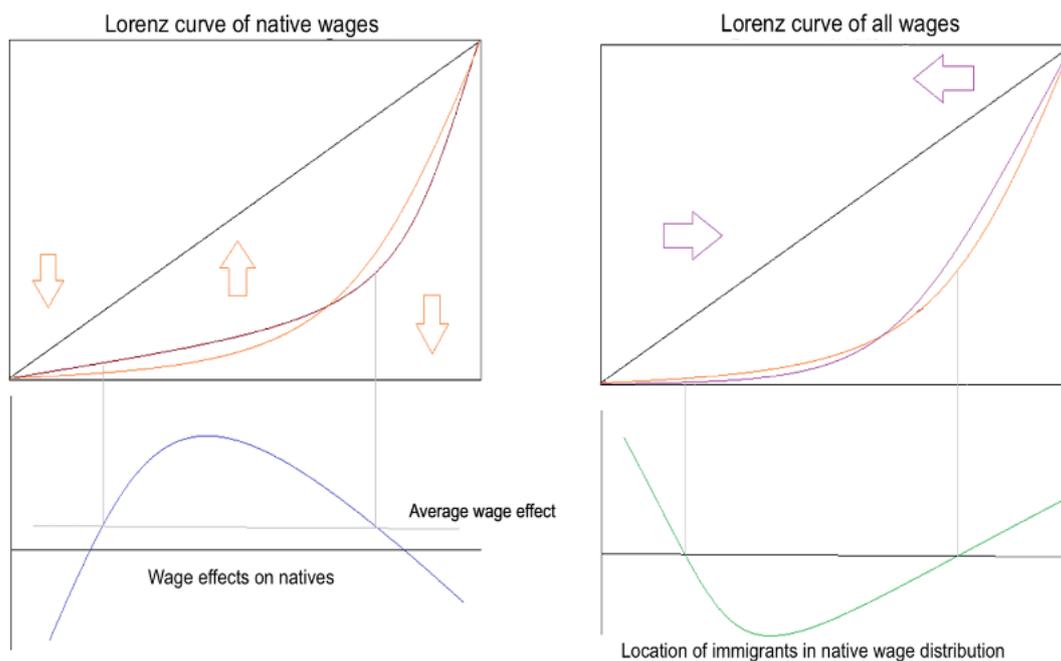
Note: The figure illustrates the way immigration affects the Lorenz curve, and thus wage inequality, in the host country in the case of multiple types of workers in the labor force. The bottom left panel shows the wage effects of immigration along the native wage distribution. The top left panel illustrates the changes in the Lorenz curve of native wages that these effects induce. The bottom right panel shows the location of immigrants in the native wage distribution. The top right panel illustrates changes in the Lorenz curve of all wages, induced by changes in the composition of the labor force, if the immigrants who arrived were located on the distribution as in the panel below.

FIGURE 15. Effect of immigration on the UK Lorenz curve 1994-2016
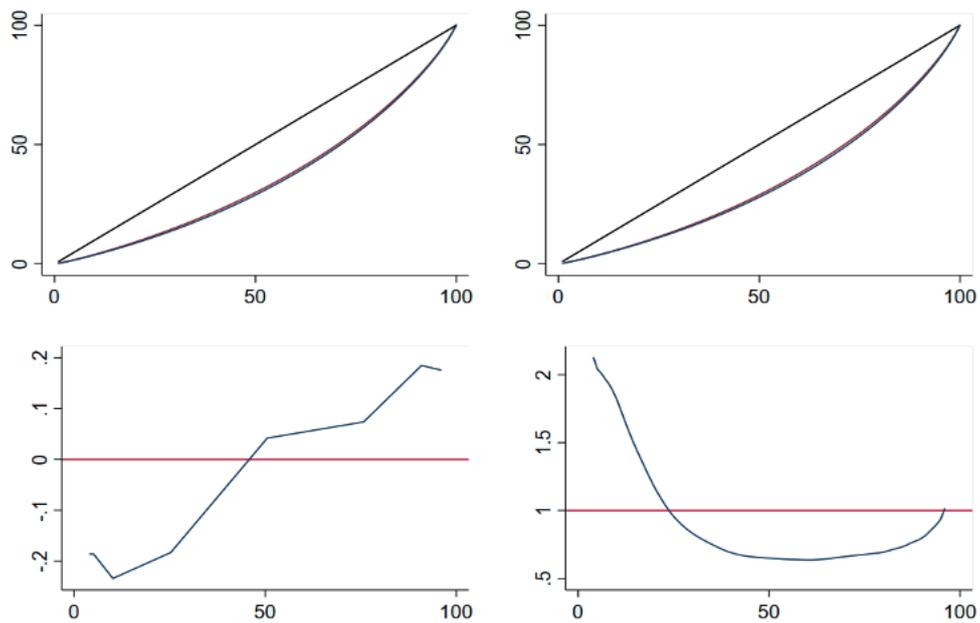
Note: The figure shows estimated changes on the Lorenz curve for UK wages during the period 1994-2016. The blue curve in the top panels illustrates the estimated Lorenz curve without immigration. The red curve in the top left panel shows the changes induced by the effects of immigration on the native wage distribution. The estimated effects on percentiles of the distribution are shown in the bottom left panel. The red curve in the top right panel illustrates the changes induced by the introduction of immigrants at percentiles in the native wage distribution according to the bottom right panel. The blue and red curves in the upper panels nearly coincide. Source: UK LFS

FIGURE 16. Theil index
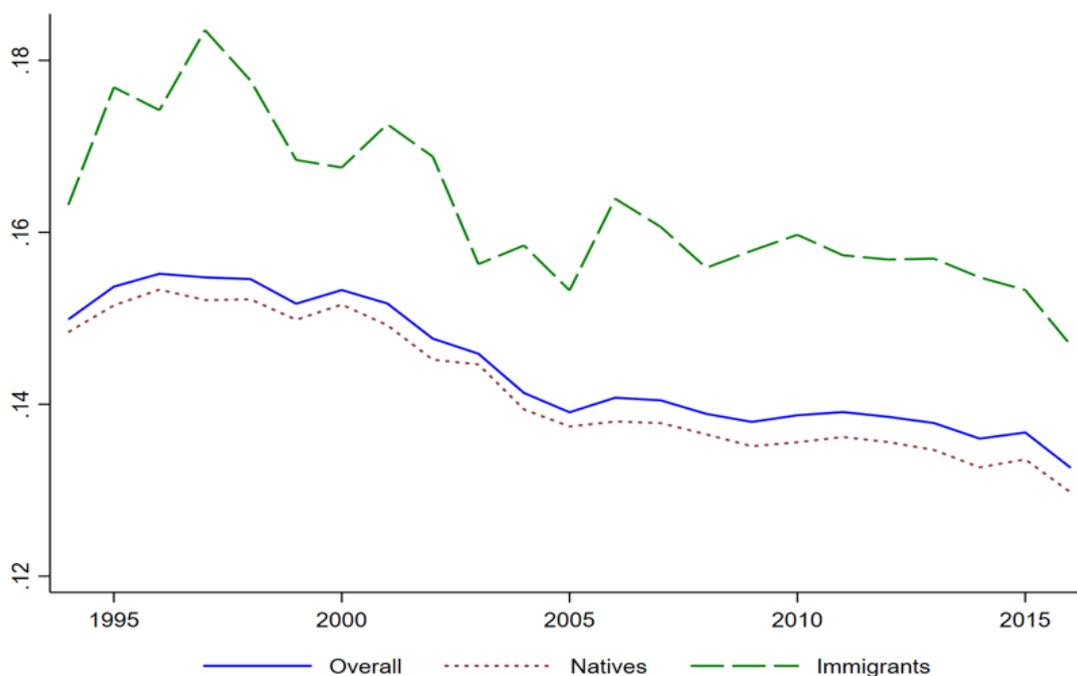
Note: The figure illustrates the evolution of the Theil index measuring overall wage inequality, within-group wage inequality for natives and within-group wage inequality for immigrants. Overall wage inequality is decomposed into within-group inequality for natives, within-group inequality for immigrants and between-group inequality for these two groups. Between-group inequality is omitted since it is close to zero. Hourly wages are deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.

Source: UK LFS 1994-2016

FIGURE 17. Wage percentile ratios
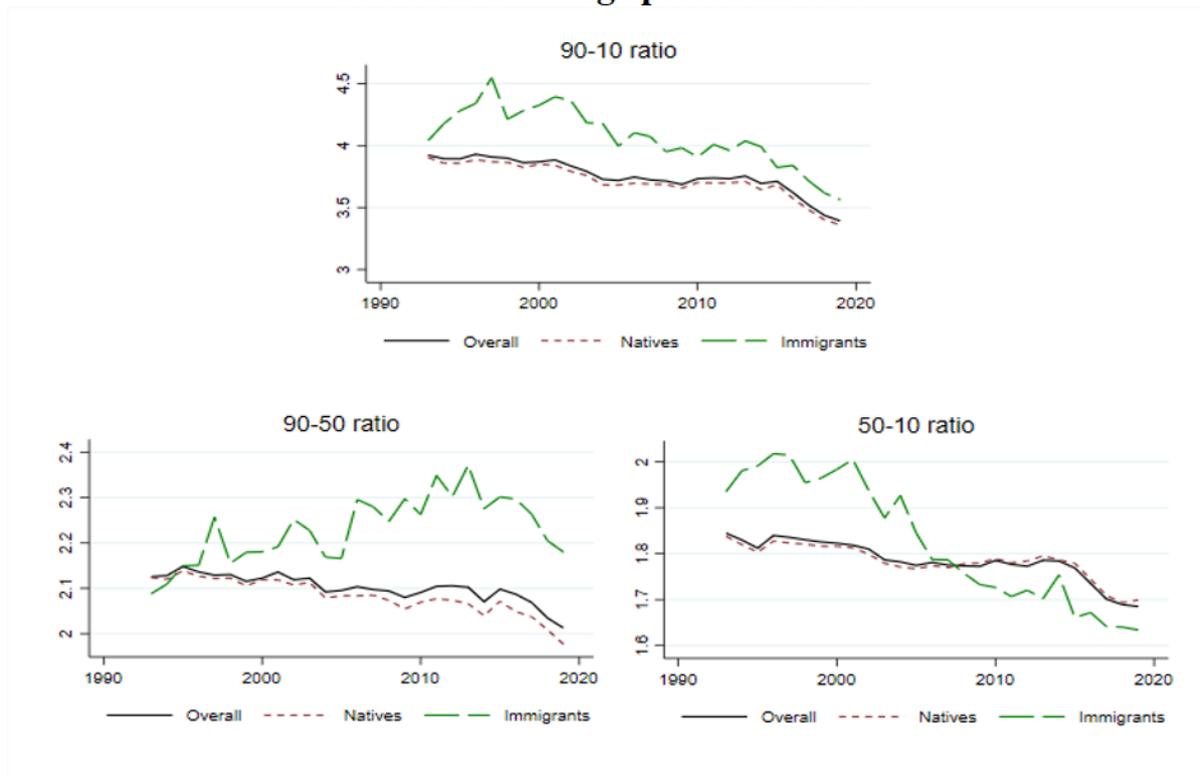
Note: The figure illustrates the evolution of percentile ratios of hourly wages for native and immigrant groups in the UK. Hourly wages are deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.
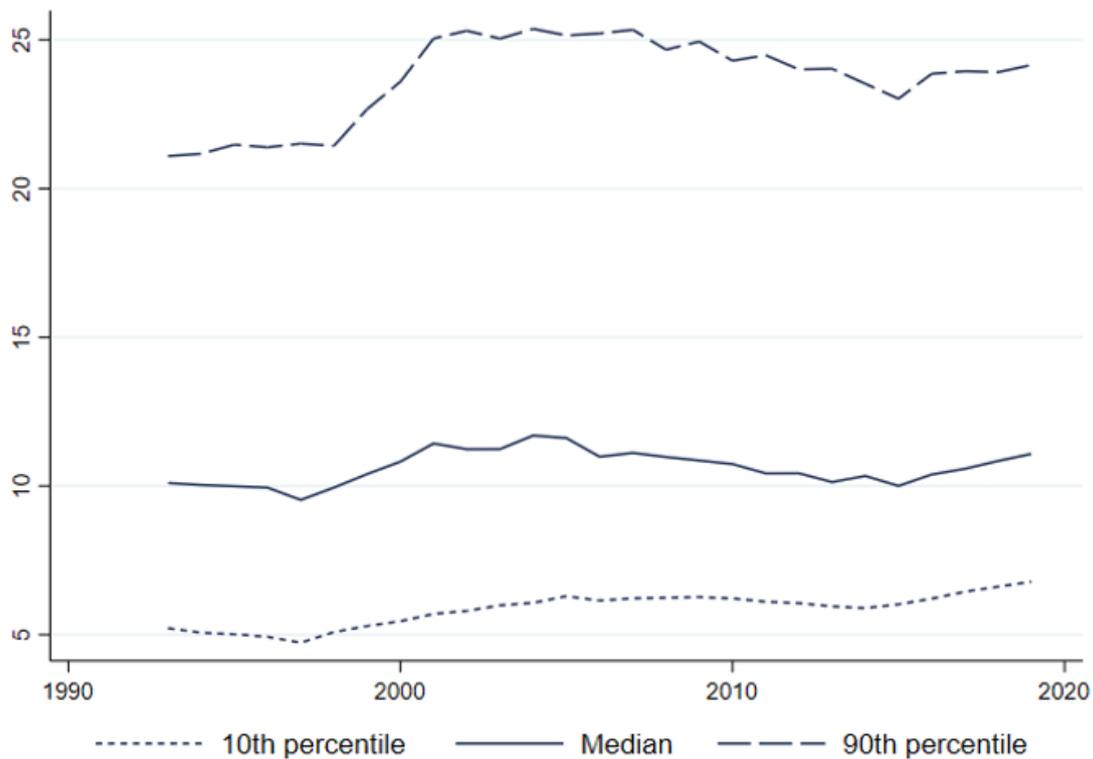Source: UK LFS 1994-2016

FIGURE 18A. Immigrant wage percentiles

Note: The figure illustrates the evolution of the 90th, the 50th and the 25th percentile of the immigrant (hourly) wage distribution in the UK. Immigrants are defined as foreign-born individuals. Hourly wages are deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.
Source: UK LFS 1994-2016

FIGURE 18B. Native wage percentiles

Note: The figure illustrates the evolution of the 90th, the 50th and the 25th percentile of the native (hourly) wage distribution in the UK. Hourly wages are deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.
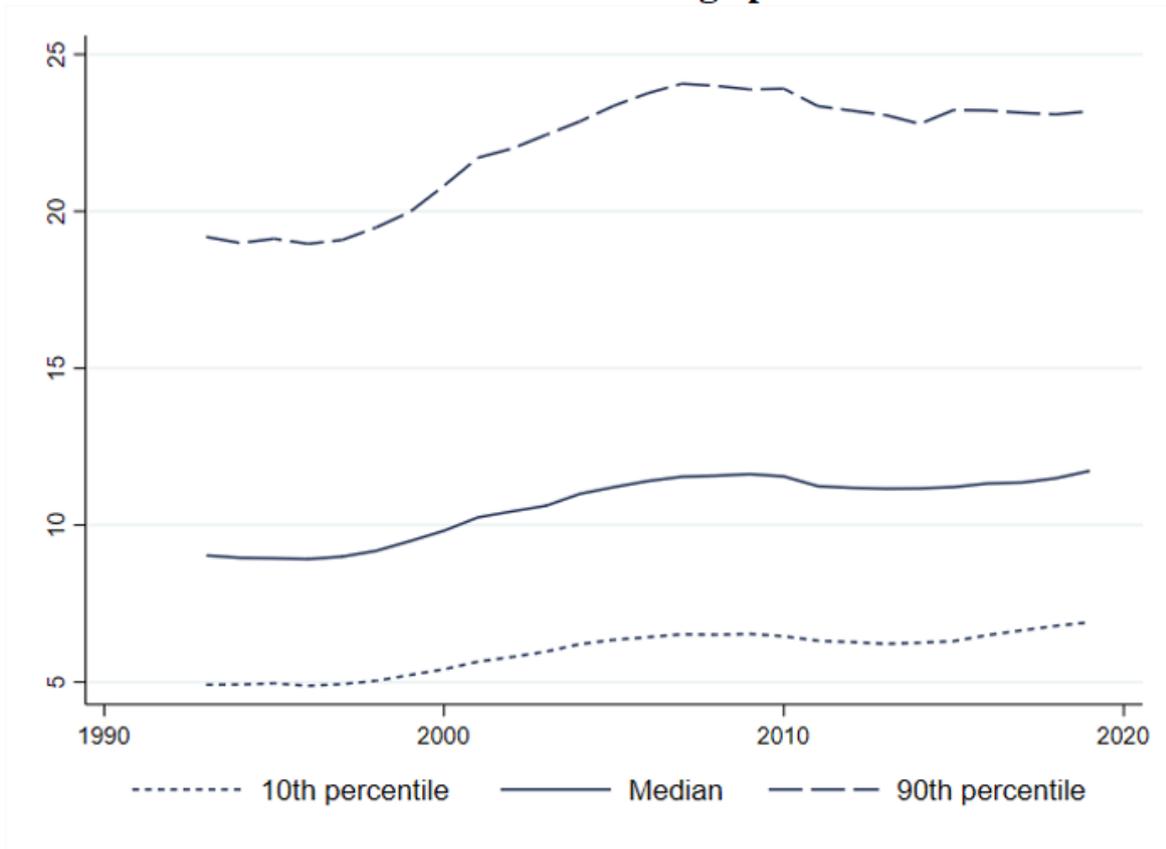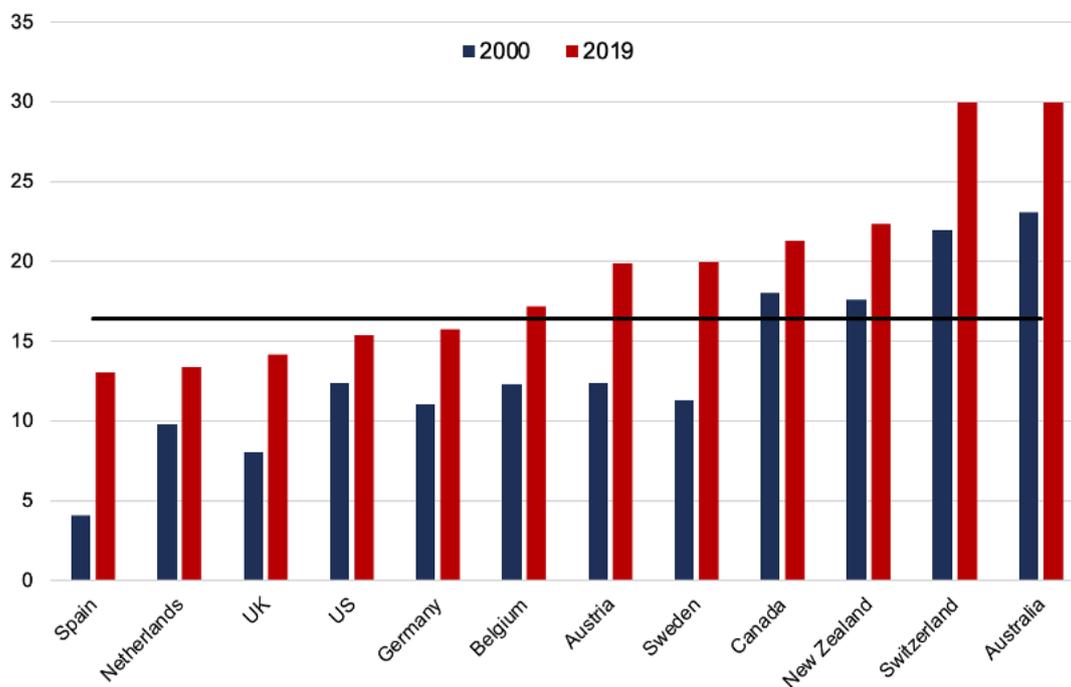Source: UK LFS 1994-2016

Appendix

FIGURE A1. International population shares of immigrants

Note: The figure illustrates the shares (%) of immigrants over the total population across different countries in 2019. The horizontal line is the 2019 average for the countries displayed in the figure weighted by their total populations.

Source: UN International migrant stock 2019

FIGURE A2. Tertiary educated immigrants across countries in 2019
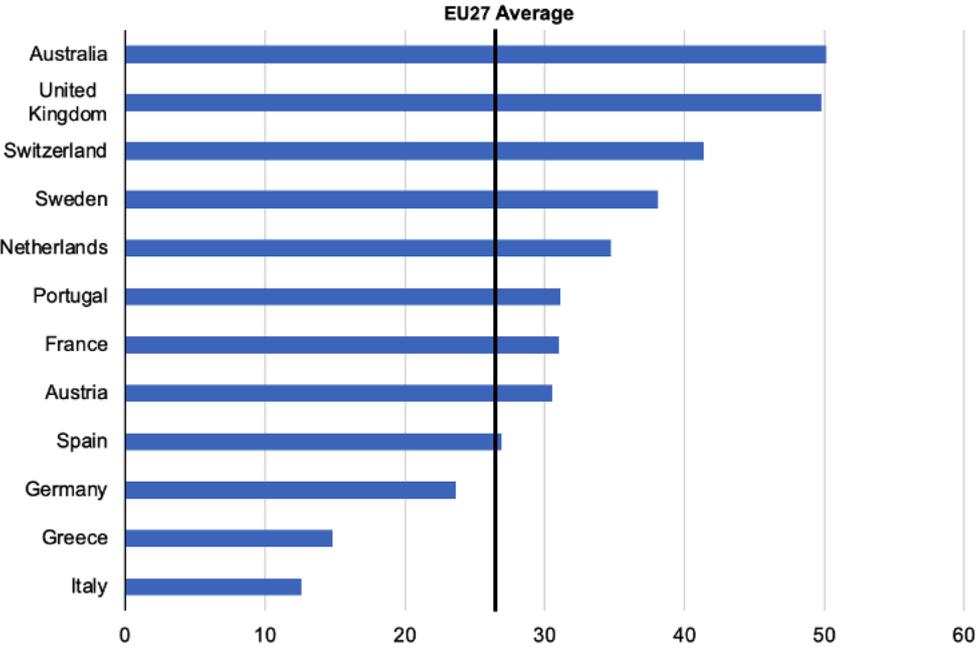
Note: The figure shows shares (%) of tertiary educated immigrants across different countries in 2019.
Source: Eurostat & Australian Bureau of Statistics.

FIGURE A3.
Predicted densities of immigrant cohorts on the native wage distribution
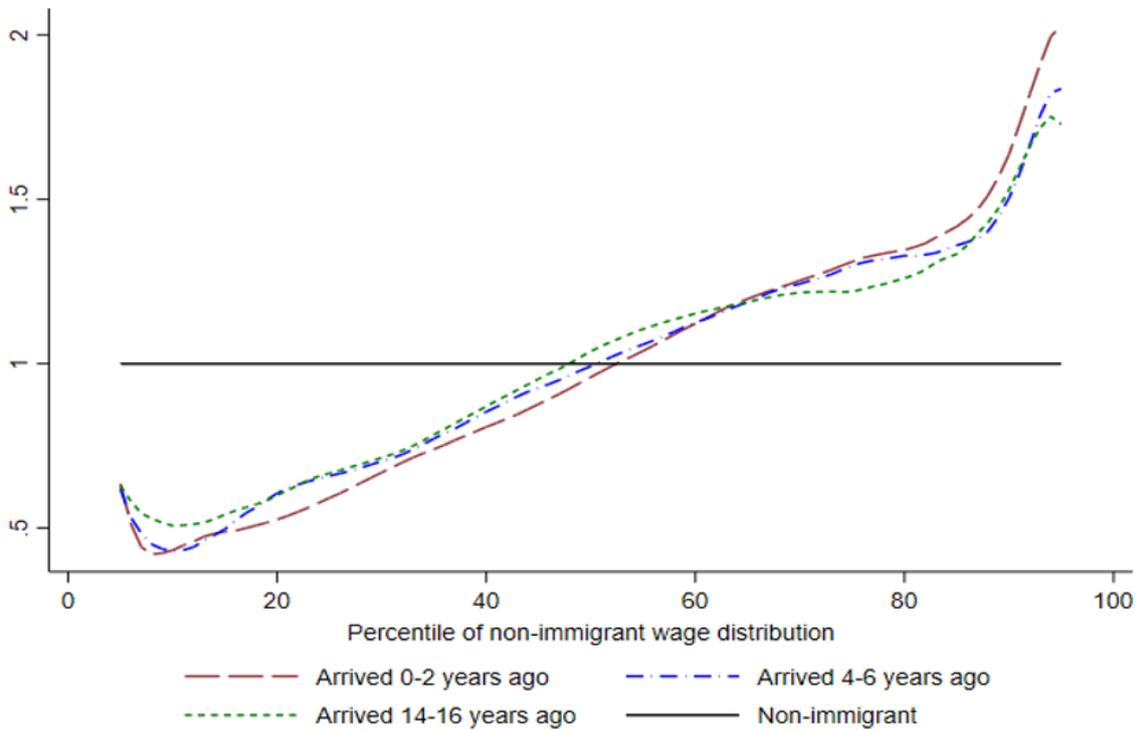
Note: The figure illustrates kernel estimates of predicted densities of immigrant cohorts that arrived 0-2, 4-6 and 14-16 years ago in the non-immigrant wage distribution. Immigrant wages are predicted solely based on education. Hourly wages are deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.

Source: UK LFS 1994-2016

TABLE A1

Effect of immigration on wage distribution - impact on different wage percentiles (1994-2016)

| | OLS | | IV [four-period lag] | |
| | First Differences | | First Differences | |
Dependent variable	(1)	(2)	(3)	(4)
5th percentile	-0.024	-0.110	**-0.186**	**-0.198**
	(0.148)	(0.147)	(0.092)	(0.091)
10th percentile	-0.097	-0.125	**-0.234**	**-0.241**
	(0.082)	(0.082)	(0.051)	(0.050)
25th percentile	-0.004	-0.065	**-0.183**	**-0.188**
	(0.096)	(0.091)	(0.059)	(0.056)
50th percentile	0.075	0.045	0.042	0.025
	(0.099)	(0.093)	(0.061)	(0.057)
75th percentile	0.031	0.001	0.074	0.050
	(0.122)	(0.107)	(0.075)	(0.065)
90th percentile	0.008	-0.056	**0.185**	**0.160**
	(0.137)	(0.127)	(0.084)	(0.078)
95th percentile	-0.196	-0.234	0.176	0.161
	(0.181)	(0.178)	(0.112)	(0.110)
F-stat for significance of excluded instruments			1855.510	1618.660
Partial R^2 for first stage regression			0.175	0.182
Year Dummies	Yes	Yes	Yes	Yes
Other Controls	No	Yes	No	Yes
Observations	391	391	391	391

Notes: Entries are the estimated regression coefficients of the ratio of immigrants to natives in regressions of different natives' wage percentiles on the ratio of immigrants to natives for years 1994–2016."Other controls" include average natives' and immigrants' age and the logarith of the ratio of natives of each education group to natives with no qualifications. Northern Ireland is excluded from the regressions as there are no data in 1994. Standard errors are in parentheses. Significant (at the 95% level) coefficients are in bold.
Source: UK LFS

TABLE A2

Effect of immigration on average wages (1994-2016)

| Dependent variable | OLS | | IV [four-period lag] | |
| | First Differences | | First Differences | |
	(1)	(2)	(3)	(4)
Average	0.020	-0.060	0.014	-0.002
	(0.152)	(0.149)	(0.094)	(0.092)
Robust average	-0.019	-0.055	0.026	0.008
	(0.086)	(0.075)	(0.053)	(0.046)
Wage index	-0.063	-0.148	-0.063	-0.063
	(0.148)	(0.148)	(0.091)	(0.091)
Robust index	-0.056	-0.091	-0.066	-0.072
	(0.075)	(0.074)	(0.046)	(0.045)
F-stat for significance of excluded instruments			1855.510	1618.660
Partial R^2 for first stage regression			0.175	0.182
Year Dummies	Yes	Yes	Yes	Yes
Other Controls	No	Yes	No	Yes
Observations	391	391	391	391

Notes: Entries are the estimated regression coefficients of the ratio of immigrants to natives in regressions of different measures of natives' average wages on the ratio of immigrants to natives for years 1994–2016. Robust average wages are computed by trimming the wage distribution at the (region- and year-specific) top and bottom percentile. The wage index is the weighted log sum of the average wage of each education group, using time-invariant weights. Its robust version uses the trimmed distribution to compute education-specific averages. "Other controls" include average natives' and immigrants' age and the logarithm of the ratio of natives in each education group to natives with no qualifications. Northern Ireland is excluded from the regressions as there are no data in 1994. Standard errors are reported in parentheses.
Source: UK LFS

Table A3. Decomposition of the Theil index measuring wage inequality over 1994-2016

YEAR	Theil Index $T(w)$	Theil within natives $T^N(w)$	Theil immigrants $T^M(w)$	Theil between-group $T^B(w)$	Compositional effect of immigration $m[T^M(w) - T^N(w)] + T^B(w)$
1994	0.151	0.150	0.166	0.00039	0.00156
1995	0.155	0.152	0.177	0.00039	0.00211
1996	0.156	0.154	0.177	0.00035	0.00191
1997	0.156	0.153	0.186	0.00023	0.00271
1998	0.155	0.153	0.179	0.00032	0.00242
1999	0.152	0.150	0.171	0.00036	0.00201
2000	0.154	0.152	0.169	0.00037	0.00172
2001	0.152	0.149	0.172	0.00052	0.00246
2002	0.148	0.145	0.169	0.00035	0.00243
2003	0.146	0.145	0.157	0.00020	0.00130
2004	0.141	0.140	0.158	0.00018	0.00183
2005	0.139	0.137	0.152	0.00008	0.00154
2006	0.141	0.138	0.165	0.00001	0.00284
2007	0.140	0.138	0.160	0.00000	0.00260
2008	0.139	0.136	0.156	0.00003	0.00237
2009	0.138	0.135	0.157	0.00001	0.00274
2010	0.138	0.135	0.160	0.00004	0.00316
2011	0.139	0.136	0.157	0.00003	0.00294
2012	0.138	0.135	0.157	0.00001	0.00295
2013	0.138	0.135	0.157	0.00005	0.00307
2014	0.136	0.132	0.155	0.00003	0.00333
2015	0.136	0.133	0.153	0.00018	0.00304
2016	0.133	0.130	0.148	0.00005	0.00297

Note: The entries in this table give the detailed decomposition of the Theil Index over native and immigrant groups. The second column includes values of the Theil index for the whole population (overall wage inequality) for each year. The third and fourth columns include values of the Theil index on inequality within the native and the immigrant group respectively. Between-group inequality is shown in the fifth column and it is very close to zero. The last column illustrates our estimate for the compositional effect of immigration on inequality, i.e. for the inequality induced by the fact that immigrants differ from natives in the distribution of wages. Hourly wages are deflated at 2015 prices (conditional on employment) and we trim the bottom and top 1% of the sample to exclude outliers.
Source: UK LFS

TABLE A4. UK citizenships granted to previously non-EU nationals by year

Year	Citizenships granted
2004	144166
2005	155452
2006	148549
2007	158504
2008	125336
2009	196843
2010	186672
2011	170520
2012	183823
2013	190446
2014	115680
2015	105087
2016	132221

Note: Grants to previously non-EU citizens are computed by subtracting the grants given to previously EU citizens from the grants given in total.
Source: Home Office Immigration Statistics